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Personal Narrative
OF TRAVELS
TO THE
EQUINOCTIAL REGIONS
OF THE
NEW CONTINENT,
DURING THE YEARS 1799—1804,

BY
ALEXANDER DE HUMBOLDT,
AND
AIMÉ BONPLAND.

WRITTEN IN FRENCH BY
ALEXANDER DE HUMBOLDT,
AND TRANSLATED INTO ENGLISH BY
HELEN MARIA WILLIAMS.

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JOURNEY

TO THE

EQUINOCTIAL REGIONS

OF

THE NEW CONTINENT.

CHAPTER XXVIII.

Political Essay on the Island of Cuba.—The Havannah.—Hills of Guanavacoa, considered in their geognostical relations.—Valley of Los Guines.—Batabano, and Port of Trinidad.—The King and Queen's Gardens.

The political importance of the island of Cuba is not founded merely on the extent of its surface, which is one-third larger than that of Hayti, on the admirable fertility of its soil, on its naval establishments, or on the nature of its population, of which three-fifths are composed of free men: it is derived also from the advantages of the geographical position of the Havannah. The northern part of the Caribbean Sea, known by the name of the Gulph of Mexico, forms a circular basin more than two hundred and fifty leagues in diameter; a *mediterranean with two outlets*, the coasts of which, from the point of Florida to Cape Catoché of Yucatan, now belong exclusively to the Confederations of the Mexican States, and of North America. The island of Cuba, or rather its coast between Cape Saint Antonio and the town of Matanzas, situated at the opening of the old channel, closes the gulph of Mexico, on the south-east, leaving the oceanic current, known by the name of the Gulph Stream *, no other outlet on the south than a strait between Cape St. Antonio and Cape Catoche; and on the north than the channel of Bahama, between Bahia-Honda and the shoals of Florida. Near the northern outlet, where the high-ways of so many trading nations may be said to cross each other, the fine port of the Havannah is situated, fortified at the same time by nature and by numerous works of art. The fleets which sail from this port, and which are partly constructed of the cedrela and the mahogany of the island of Cuba, might act at the entrance of the Mexican Mediterranean, and menace the opposite coast, as the fleets that sail from Cadiz command the ocean near the Pillars of Hercules. In the meridian of the Havannah, the gulph of Mexico, the old channel, and the channel of Bahama unite. The opposite direction of the currents, and the violent agitations of the atmosphere at the beginning of winter, give a peculiar character to these latitudes, at the extreme limit of the equinoxial zone.

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* Vol. i, p. 47—64; vol. vi, p. 817.

The island of Cuba is not only the largest of the Antilles (its area differing little in extent from that of England, properly so called, without Wales), but presents by its narrow and lengthened form such a developement of coast, that it approaches at the same time Hayti and Jamaica, the most southern province of the United States (Florida), and the most easterly province of the Mexican Confederation (Yucatan). This circumstance merits the most serious attention; for the countries which communicate by a navigation of from ten to twelve days, Jamaica, Hayti, Cuba, and the southern parts of the United States (from Louisiana to Virginia), contain nearly two millions eight hundred thousand Africans. Since Santo Domingo, the Floridas, and New Spain, have been separated from the mother country, the island of Cuba is no longer connected except by a common worship, language, and manners, with the neighbouring countries, which during ages were subject to the same laws.

Florida forms the last link in the long chain of which the northern extremity reaches the basin of St. Lawrence, and extends from the region of palm trees to that of the most rigorous winter. The inhabitant of New England regards the increasing augmentation of the black population, the preponderance of the slave states, and the predilection for the cultivation of colonial products, as a public danger, and earnestly wishes that the strait of Florida, the present limit of the great American Confederation, may never be passed but with the views of free trade, founded on equal rights. If he fears events which may place the Havannah under the dominion of an European power more formidable than Spain, he does not the less desire that the political ties by which Louisiana, Pensacola, and Saint Augustin of Florida, were heretofore united to the island of Cuba, may remain for ever broken.

The extreme sterility of the soil, and the want of inhabitants and of cultivation, have at all times rendered the neighbourhood of Florida of small importance to the trade of the Havannah; the case is not the same on the coasts of Mexico, which, stretching in a half circle, from the frequented ports of Tampico, Vera Cruz, and Alvarado to cape Catoche, almost touch by the peninsula of Yucatan the western part of the island of Cuba. Commerce is extremely active between the Havannah and the port of Campeche; and increases notwithstanding the new order of things in Mexico, because the trade equally illicit with a more distant coast, that of Caraccas or Columbia, employs but a small number of vessels. In such difficult times, the provision of salt meat *(tasajo)*, necessary for the subsistence of the slaves *, is drawn with less danger from Buenos Ayres and the plains of Merida, than from those of Cumana, Barcelona, and Caraccas. It is known that the island of Cuba and the Archipelago of the Phillipines, have for ages drawn from New Spain the funds necessary for the internal administration, and for keeping up the fortifications, arsenals, and dock yards *(situados de atencion maritima)*. The Havannah, as I have stated in another work †, was the military port of the New World, and, till 1808, received annually 1,800,000 piastres from the Mexican treasury. At Madrid it was long the custom to consider the island of Cuba and the archipelago of the Phillipines, as dependencies on Mexico, situated at very unequal distances, east and west of Vera Cruz and Acapulco, but linked to the Mexican metropolis, then an European colony itself, by all the ties of commerce, mutual aid, and antient affections. The increase of internal wealth has rendered unnecessary the pecuniary succour which Cuba used to draw from the

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* Vol. iii, p. 361; vol. iv, p. 338.

† Political Essay, vol. iv, p. 273.

Mexican treasury. Of all the Spanish possessions, that island has most prospered; the port of the Havannah has risen, since the troubles of Saint Domingo, to the rank of one of the first places of the commercial world. A fortunate concurrence of political circumstances; the moderation of the crown officers; the conduct of the inhabitants, who are intelligent, prudent, and much engaged with their own interests, have preserved to the Havannah the uninterrupted enjoyment of the freedom of interchange with foreign nations. The revenue of the customs has increased so prodigiously, that the island of Cuba suffices not only for its own wants, but during the struggle between the mother country and the Spanish colonies of the continent, furnished considerable sums to the remains of the army which had fought at Venezuela, to the garrison of the castle of San Juan d'Uloa, and also towards very expensive and most commonly useless armaments.

I resided twice in this island, once during three months, and once during six weeks; and enjoyed the confidence of persons, who, from their abilities, and their situation as administrators, proprietors, or merchants, were enabled to give me the best information respecting the increase of public prosperity. The particular protection with which I was honoured by the Spanish minister, justified this confidence, and which I flattered myself I merited by the moderation of my principles, a circumspect conduct, and by the nature of my peaceful labors. For thirty years past the Spanish government has not shackled the publication, even at the Havannah, of the most valuable statistic documents on the state of commerce, colonial agriculture, and finance. I examined those documents; and the connections I have maintained with America since my return to Europe have enabled me to complete the materials I had collected on the spot. I visited with Mr. Bonpland only the vicinity of the Havannah, the beautiful valley of Guines, and the coast between Batabano and the port of Trinidad. After having succinctly described the aspect of this scenery, and the singular modifications of a climate so different from that of the other islands, I shall examine the general population of Cuba, its *area* calculated from the most exact sketch of the coast, the objects of trade, and the state of the public revenue.

The aspect of the Havannah, at the entrance of the port, is one of the gayest and most picturesque on the shore of Equinoxial America, north of the equator. This spot, celebrated by travellers of all nations, has not the luxury of vegetation that decorates the banks of the river Guayaquil, nor the wild majesty of the rocky coast of Rio Janeiro, two ports of the southern hemisphere; but the graces which in those climates embellish the scenes of cultivated nature, are here mingled with the majesty of vegetable forms, and the organic vigour that characterizes the torrid zone. Amidst a variety of soothing impressions, the European forgets the dangers that menace him in the populous cities of the Caribbean islands; he seeks to seize the different elements of a vast landscape; to contemplate the fortified castles that crown the rocks on the east of the port; the inland basin, surrounded by villages and farms; those palms that rise to a majestic height; and that city, half concealed by a forests of masts and the sails of vessels. In entering the port of the Havannah you pass between the fortress of Morro *(Castillo de los Santos Reyes,)* and the fort of *San Salvador de la Punta:* the opening is only from one hundred and seventy to two hundred toises wide. It preserves this breadth during three-fifths of a mile. Having passed this narrow entrance, and left on the north the fine castle of *San Carlos de la Cabana,* and the *Casa Blanca,* we reach a basin in the form of a trefoil, of which the great axis, stretching from S.S.W. to N.N.E., is two miles and one-fifth long. This basin communicates with three creeks, that of Regla, Guanavacoa, and Atares, of which the last has some springs of fresh water. The town of the Havannah, surrounded by walls, forms a promontory bounded on the south by the arsenal, and on the north by the fort of la Punta. Beyond the vestiges of some vessels sunk in the shoals of la Luz, we no longer find eight to ten, but five to six fathoms of water. The castles of *Santo Domingo de Atares* and *San Carlos del Principe*, defend the town towards the west; they are distant from the interior wall on the land side, the one 660 toises, the other 1240. The intermediate space is filled by the suburbs (*arrabales* or *barrios extra muros*) of the Horcon, Jesus Maria, Guadaloupe, and Senor de la Salad, which from year to year contract the Field of Mars *(Campo de Marte)*. The great edifices of the Havannah, the cathedral, the *Casa del Govierno*, the house of the commandant of the marine, the arsenal, the *Correo* or General Post Office, and the factory of tobacco, are less remarkable for their beauty than the solidity of their construction; the streets are for the most part narrow, and the greater number are not paved. The stones coming from Vera Cruz, and their transport being very expensive, the idea was conceived a short time before my voyage, of joining great trunks of trees together, as is done in Germany and Russia, when dykes are constructed across marshy places. This project was soon abandoned, and travellers recently arrived saw with surprize the fine trunks of *Cahoba* (mahogany) sunk in the mud of the Havannah. At the time of my stay, few towns of Spanish America presented, from the want of a good police, a more hideous aspect. People walked in mud up to the knee; and the multitude of caleches or *volantes*, the characteristic equipage of the Havannah, the carts loaded with cases of sugar, the porters who elbow the passengers, rendered walking disagreeable and humiliating. The smell of *tasajo*, or meat ill dried, often poisons the houses, and the winding streets; but it appears that of late the police has interposed, and that a sensible improvement has taken place in the cleanliness of the streets; that the houses are more airy, and that the *Calle de los Mercadares* presents a fine aspect. Here, as in the oldest towns of Europe, an ill-traced plan of streets can only be slowly amended.

There are two fine walks; the *Alamada*, between the hospital of Paula and the theatre, of which the interiour was decorated with great taste, in 1803, by an Italian artist, M. Peruani; and the other, between the Castillo de la Punta, and the *Puerta de la Muralla*, called the *Passeo extra muros*, has a delicious coolness, and is frequented by carriages after sun-set. It was begun by the Marquis de la Torre, governor of the island, who gave the first and happiest impulse to the improvement of the police, and the municipal regime. Don Luis de las Casas, whose name is equally dear to the inhabitants of the Havannah, and the Count of Santa Clara, enlarged these plantations. Near the *Cámpo de Marte* is the Botanical Garden, well worthy to fix the attention of government, and another object, fitted to excite at once pity and indignation, the barracks before which the wretched slaves are exposed to sale. A statue in marble of Charles III. has been placed since my return to Europe in this *Extra muros* walk. This spot was at first destined for a monument to Christopher Columbus, whose ashes, after the cession of the Spanish part of Saint Domingo, were brought to the island of Cuba. The same year the ashes of Fernand Cortez were transferred in Mexico from one church to another: thus at the same time, at the end of the 18th century, the two greatest men who promoted the conquest of America, received new sepulchres.

The most majestic palm-tree of its tribe, the *Palma real*, gives a peculiar character to the landscape in the vicinity of the Havannah; it is the *Oreodoxa regia* of our description of American palm-trees*; it's tall trunk, a little swelled towards the middle, rises to 60 or 80 feet high; the upper part glossy, of a tender green newly formed by the closing and dilatation of the petioles, contrasts with the rest, which is whitish and fendilated. It appears like two columns which surmount on another. The *Palma real* of the Island of Cuba has feathered leaves rising perpendicularly towards the sky, and curved only at the point. The form of this plant reminded us of the *Vadgiai* palm-tree that covers the rocks in the cataracts of the Oroonoko, balancing it's long points over a mist of foam. Here, as every where else where the population is concentred, vegetation diminishes. Those palm-trees round the Havannah, and in the amphitheatre of Regla, on which I delighted to gaze, disappear by degrees. The marshy places which I saw covered with Bambousacees, are cultivated and drained. Civilization advances, and the soil, more stript of plants, scarcely offers any traces of its wild abundance. From the Punta to San Lazaro, from Cabana to Regla, and from Regla to Atarès, the road is covered with houses, and those that surround the bay are of a light and elegant construction. The plan of these houses is traced, and they are ordered from the United States, like a piece of furniture. When the yellow fever rages at the Havannah, the proprietors withdraw to those country-houses, and on the hills between Regla and Guanavacoa, to breathe a purer air. In the coolness of the night, when the boats cross the bay, and from the phosphorescence of the water, leave behind them long tracks of light, these romantic scenes furnish charming and peaceful retreats to the inhabitants who fly from the tumult of a populous city. Travellers, in order to judge of the progress of cultivation, should visit the small *chacaras* of maize, and other alimentary plants, the straight lines of *ananas* in the fields of Cruz de Piedra, and the bishop's garden *(Quinta del Obispo)*, which of late is become a delicious spot.

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* *Nova genera et Spec. æquin.*, Tom. i, p. 305.

The town of the Havannah, properly so called, surrounded by walls, is only 900 toises long, and 500 broad; yet more than 44,000 inhabitants, of which 26,000 are blacks and mulattoes, are crowded together in this narrow space. A population nearly as considerable has found refuge in the two great suburbs of *Jesus-Maria* and the *Salud*. The latter does not merit the fine name it bears; the temperature of the air is indeed less elevated than in the city, but the streets might have been larger and better planned. The Spanish engineers have made war for 30 years past with the inhabitants of the suburbs or *arrabales;* they have proved to the government that the houses are too near the fortifications, and that the enemy might lodge there with impunity. But the government have not the courage to demolish the suburbs and drive away a population of 28,000 inhabitants collected in the *Salud* only. Since the great fire of 1802, that quarter has been considerably enlarged; barracks were at first constructed, but by degrees those barracks became houses. The inhabitants of the *arrabales* have presented several projects to the king, by which they might be comprehended within the line of the fortifications of the Havannah, and their possession be legalized, which is at present only founded on tacit consent. They wish to construct a great moat from the Puente de Chaves, near Matadero, to San Lazaro, to form the Havannah into an island. The distance is nearly 1200 toises, and the bay terminates between the arsenal, and the Castillo de Atarès, in a natural canal bordered by mangliers, and cocolloba. By this means the town towards the west, on the land-side, would have a triple range of fortifications externally; the works of Atares and Principe, placed on the eminences, then the projected moat, and lastly the wall and ancient covered-way of the Count of Santa Clara, which cost 700,000 piastres. The defence of the Havannah towards the west is of the highest importance; as long as the besieged are masters of the town, properly so called, and of the southern part of the bay, the *Morro Cabana*, the first requiring 800 defenders, the second 2000, they are impregnable, because they can be provisioned by the Havannah, and the losses of the garrison repaired. I have heard well-informed French engineers assert that an enemy should begin his operations by taking the town in order to bombard the Cabana, a strong fortress, but where the garrison, shut up in the cassmates, could not long resist the insalubrity of the climate. The English took the *Morro* without being masters of the Havannah; but the *Cabana* and the *Fort No.* 4, which commands the *Morro*, did not then exist. The most important works on the south and west, are the *Castillos de Atarè y del Principe*, and the battery of *Santa Clara*.

OFFICIAL ENUMERATION (PADRON) OF THE HAVANNAH (THE CITY PROPERLY SO CALLED), ACCORDING TO THE DIFFERENCE OF COLOUR, AGE, AND SEX, IN 1810.

COLOUR.	MEN.			WOMEN.			TOTAL of MEN and WOMEN.
	a. one day to 15 years.	*b.* from 15 to 60 years.	*c.* from 60 to 100 years.	*d.* one day to 15 years.	*e.* from 15 to 60 years.	*f.* from 60 to 100 years.	*g.*
Whites - - -	3.146	6.057	348	2.860	5.478	476	18.365
Free Pardos - -	804	1.103	116	725	1.515	141	4.414
Free Blacks - -	833	1.149	133	819	2.308	284	5.886
Pardos Slaves -	227	153	194	197	119	183	1.073
Black Slaves -	1.781	4.699	78	1.561	5.224	94	13.437
Total - - - -	6.791	13.161	869	6.162	14.644	1.178	43.175

Official enumeration of the Suburb (Arrabal) of the Salud, in 1810.

COLOUR.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
Whites - - -	3.261	1.312	874	3.687	1.812	744	11.690
Free Pardos -	460	779	40	190	1.000	8	2.477
Free Blacks -	500	2.489	17	587	3.026	113	6.732
Pardos Slaves -	100	220	8	77	189	11	605
Black Slaves -	448	3.552	15	558	2.300	42	6.915
Total - - - -	4.769	8.352	954	5.099	8.327	918	28.419

Official enumeration of the Arrabal of Jesus Mariá, in 1810.

COLOUR.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
Whites - - -	658	720	274	480	974	257	3.363
Free Pardos -	326	399	169	268	551	174	1.887
Blacks - - -	499	628	304	370	838	314	2.953
Pardos Slaves -	83	32	58	74	77	56	400
Black Slaves -	508	719	241	347	976	281	3.022
Total - - -	2.074	2.518	2.046	1.530	3.416	1.032	11.625

Official enumeration of the Arrabal of the Horcon, in 1810.

COLOUR.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
Whites - -	132	329	49	218	287	31	1.046
Free Pardos	72	62	17	64	91	18	324
Free Blacks	44	30	11	41	60	16	202
Pardos Slaves	37	17	10	34	17	10	125
Black Slaves	56	544	16	71	96	10	593
Total - -	341	782	103	428	551	85	2.290

Official enumeration of the Arrabal of Cerro, in 1810.

COLOUR.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
Whites - - -	259	302	8	258	252	4	1.083
Free Pardos -	27	31	1	35	34	2	130
Free Blacks -	15	33	2	10	40	2	102
Pardos Slaves -	0	0	0	0	0	0	0
Black Slaves -	144	343	7	72	118	1	685
Total - - -	445	709	18	375	444	9	2.000

Official Enumeration of the Arrabal of San Lazaro, in 1810.

COLOUR.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
Whites - - -	211	414	82	223	396	59	1.385
Free Pardos -	34	44	5	55	66	11	215
Free Blacks -	22	34	18	26	63	18	181
Pardos Slaves -	22	27	1	23	19	2	94
Black Slaves -	71	294	30	77	223	18	713
Total - - -	360	813	136	404	767	108	2.588

Official enumeration of the Arrabal of Jesus del Monte, in 1810.

COLOUR.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
Whites	868	390	187	565	486	223	2.719
Free Pardos	22	16	24	32	21	11	126
Free Blacks	45	51	112	82	94	62	446
Pardos Slaves	0	0	0	0	0	0	0
Black Slaves	181	204	60	52	111	90	698
Total	1.116	661	383	731	712	386	3.989

Official enumeration of Regla, in 1810.

COLOUR.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
Whites - - -	353	430	22	331	415	25	1.576
Free Pardos -	20	45	0	41	64	0	170
Free Blacks -	14	30	2	13	42	3	104
Pardos Slaves -	0	0	0	0	0	0	0
Black Slaves -	37	105	5	132	86	3	368
Total - - -	424	610	29	517	607	31	2.218

General Result of the Population of the Havannah (the city, with the Suburbs of La Salud or Guadaloupe, Jesus Maria, Horcon, Cerro, San Lazaro, Jesus del Monte, and Regla) in 1810.

I. According to Colour, Age, and Sex.

COLOUR.	MEN.				WOMEN.				TOTAL of men and women.
	from 1 day to 15 years.	from 15 to 60 years.	from 60 to 100 years.	Total of men.	from 1 day to 15 years.	from 15 to 60 years.	from 60 to 100 years.	Total of women.	
Whites	8.888	9.914	1.844	20.646	8.624	11.100	1.819	21.543	41.189
Free Pardos	1.775	2.479	380	4.626	1.410	3.342	365	5.117	9.743
Free Blacks	2.032	4.744	599	7.375	1.948	6.471	810	9.229	16.604
Pardos Slaves ...	469	469	271	1.209	405	421	262	1.088	2.297
Black Slaves	8.226	10.260	452	13.938	2.870	9.134	489	12.493	26.471
Total	16.390	27.906	3.538	47.834	15.255	29.468	3.747	48.470	96.304

II. According to the Suburbs.

NAMES OF THE ARRABALS.	WHITES.	Free PARDOS.	Free BLACKS.	PARDOS Slaves.	BLACK Slaves.	TOTAL.
The Havannah	18.361	4.414	5.880	1.073	13.437	43.175
La Salud	11.690	2.477	6.732	605	6.915	28.419
Jesus Maria	3.363	1.887	2.953	400	3.022	11.625
Horcon	1.046	324	202	125	593	2.290
Cerro	1.083	130	102	0	685	2.000
San Lazaro	1.385	215	181	94	713	2.588
Jesus del Monte	2.719	126	446		698	3.989
Regla	1.576	170	104	0	368	2.218
Total	41.227	9.743	16.606	2.297	26.431	96.304
		26.349		28.728		

RECAPITULATION.

Whites		41.227
Free Pardos	9.743	26.349
Free Blacks	16.606	
Pardos Slaves	2.297	28.728
Black Slaves	26.431	
		96.304

We have noted in these tables, under the name of *pardos* (copper-coloured men), all who are not *morenos*, that is, of pure negro race. The land forces, the sailors and soldiers of the royal marine, the monks, nuns, and strangers not established, *(transeuntes)* are not comprized in the enumeration of 1810; of which, by an error, the results have been inserted, in several works of merit published recently, as belonging to the year 1817. The garrison of the Havannah amounts generally to 6000 men, and the number of strangers to 20,000; there is therefore no doubt that the total population of the Havannah and the seven arrabals now surpasses (in 1825), 130,000. The following table marks the increase of the population of the Havannah and of its suburbs, since the enumeration made in 1791, to 1810, by order of the Captain General Don Luis de las Casas.

PERIODS OF THE ENUMERATION.	WHITES.	FREEMEN OF COLOUR.	SLAVES.	TOTAL.	PROPORTION OF THE THREE CLASSES.
1791	23.737	9.751	10.849	44.337	53 - - 22 - - 25
1810	41.227	26.349	28.720	96.296	43 - - 27 - - 30
Increase - -	17.490	16.598	17.871	51.967	

Increase of the Whites	73	per cent.
of Free men of Colour	171	
of Slaves	165	
of every Class	117	

We shall here add the augmentation of the population during half this interval, from 1800 to 1810, but only for the *barrio extra muros de Guadalupe :*

PERIODS.	WHITES.	FREE MEN OF COLOUR.		TOTAL of free men of colour.	SLAVES.		TOTAL of Slaves	TOTAL.
		Pardos.	Blacks.		Pardos.	Blacks.		
1800	3.323	1.087	1.243	2.330	92	1.766	1.858	7.511
1810	11.690	2.477	6.732	9.209	605	6.915	7.520	28.419
Increase -	8.367	1.390	5.489	6.879	513	5.149	5.762	20.908

Increase of the Whites...............	251	Per cent.
of freedmen...............	295	
of slaves...............	310	
of the three classes...............	278	

We have just seen that the population has more than doubled in twenty years, from 1791 to 1810; in the same interval of time, the population of New York, the most populous city of the United States, rose from 33,200 to 96,400; it amounts now to 140,000: consequently a little superiour to that of the Havannah, and nearly equal to the population of Lyons. The town of Mexico, which in 1820 counted 170,000 inhabitants, appears to me to hold the first rank among the towns of the New Continent. It is perhaps fortunate for the free states of that part of the world, that only six towns of America, Mexico, New-York, Philadelphia, the Havannah, Rio Janeiro and Bahia, have attained a population of 100,000 souls. At Rio Janeiro, there are 105,000 blacks, on a population of 135,000 persons: at the Havannah the whites form two-fifths of the whole population. We find in that town the same preponderance of women that is observed in the principal towns of the United States, and of Mexico*.

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* The enumerations of Boston, New York, Philadelphia, Baltimore, Charlestown, and New Orleans, yield for women in relation to men, 109 : 100; at Mexico were found 92,838 women, and 76,008 men, which yields a still more extraordinary comparison, that of 122 : 100. I have already treated of this subject in another place, (*Political Essay*, vol. i, p. 247,) where I observed that, in comprehending in the same point of view the whole population of the villages and cities,

births to the population, 1 : 33,5 ; and the relation of deaths to the population, 1 : 33,2. According to the late accurate labours on the population of France, these relations are, for the whole of France, as 31⅔ : 1 and 39⅔ : 1 ; for Paris, from 1819 to 1823, as 1 : 28, and 1 : 31,6. The circumstances that modify these numerical elements in great towns, are so complicated and of so variable a nature, that the number of inhabitants can scarcely be appreciated by that of births and deaths. In 1806, a period at which the population of Mexico was little above 150,000, the number of births and deaths was 5166, and 6155 ; while at the Havannah, on 130,000 inhabitants, the numbers, mean term, are 3900 and 3880. In this town there are two hospitals, in which the number of sick is considerable ; the general hospital (of *Caridad* or *San Felipe y Santiago*), and the military hospital of San Ambrosio *.

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* See my *Political Essay*, vol. iv, p. 195, on the mean mortality of the hospitals at Vera Cruz and at Paris.

ANNUAL MOVEMENT.	MILITARY HOSPITAL OF SAN AMBROSIO.			GENERAL HOSPITAL OF SAN FELIPE Y SANTIAGO.		
	1814.	1821.	1824.	1814.	1821.	1824.
Remained in the beds since the former year -	226	307	264	153	251	127
Entered in the course of the year - - - - - -	4352	4829	4160	1484	2596	2196
Total - - - - -	4578	5136	4424	1637	2847	2323
Deaths - - - - - - -	164	225	194	283	743	533
Gone out cured - - -	4208	4623	3966	1224	1948	1651
Remained ill in the beds -	206	283	264	130	156	139

In the *general hospital*, mean year, more than 24 per cent perished; and in the military hospital scarcely 4 per cent. It would be unjust to attribute this immense difference to the treatment employed by the monks of San Juan de Dios, who preside over the former establishment. More sick persons, no doubt, enter the hospital of San Ambrosio, attacked by the *vomito* or the yellow fever, but the greater number have only slight maladies; while, on the contrary, the general hospital receives the old, and incurable negroes, who have but a few months to live, and whom the planters or masters (*los amos*) get rid of in this manner. It may also be admitted in general, that by the improvement of the police the sanitary state of the Havannah is ameliorated; but the effect of these changes is only manifest among the natives. Strangers who come from the north of Europe and America, suffer from the influence of the climate; and would continue to suffer, whatever were the degree of cleanliness in the streets. Such is the influence of the shore, that the inhabitants of the island who live at a distance from the coast, are often attacked with the *vomito* when they arrive at the Havannah. The markets of the town are well furnished; in 1819, the price of provisions was carefully estimated, which are daily brought to the markets of the Havannah by 2000 beasts of burden;

and it was found that the consumption in meat, maize, manioc, vegetables, brandy, milk, eggs, forage, and snuff, amounts to 4,480,000 piastres yearly.

We employed the months of December, January, and February, in making observations in the vicinity of the Havannah and the fine plains of Guines. We found in the family of M. Cuesta, which then formed with M. Santa Maria one of the greatest commercial houses in America, and in the house of the Count O'Reilly, the attentions of the most noble hospitality. We lived with the former, and placed our collections and instruments in the spacious hotel of the Count O'Reilly, of which the terraces favored especially our astronomical observations. The longitude of the Havannah was at this period more than one-fifth of a degree uncertain *. It had been fixed by M. Espinosa, the learned director of the *Deposito hydrografico* of Madrid, at 5h 38′ 11″, in a table of positions which he communicated to me on leaving Madrid. M. de Churruca fixed the Morro at

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* *Humboldt, Rec. d'Obs. Astr.*, tom. ii, p. 53, 89. I also fixed, by direct observations, several positions in the interior of the island. (Rio Blanco, plantation of Count Jaruco y Mopex; the Almirante, plantation of the Countess Buenavista; San Antonio de Beitia; the village of Managua; San Antonio de Bareto, and the Fondadero, near the town of San Antonio de los Baños). *L. c.*, p. 58—67.

5h 39′ 1″. I met at the Havannah with one of the most able officers of the Spanish navy, Captain Don Dionisio Galeano, who had taken a survey of the coast of the strait of Magellan. We made observations together, on a series of eclipses of the satellites of Jupiter, of which the mean result gave 5h 38′ 50″. M. Oltmanns deduced in 1805, the whole of those observations, which I marked for the Morro, at 5h 38′ 52·5″ = 84° 43′ 7·5″ west of the meridian of Paris. This longitude was confirmed by fifteen occultations of stars observed from 1809 to 1811, and calculated by M. Ferrer *: that excellent observer fixes the definitive result at 5h 38′ 50·9″. With respect to the magnetic dip, I found it by the compass of Borda (Dec. 1800), 53° 22′ of the ancient sexagesimal division: twenty-two years before, according to the very accurate observations made by Captain Sabine, in his memorable voyage to the coasts of Africa, America, and Spitzbergen, the dip was only 51° 55′; it had therefore diminished 1° 27′. More to the east, but also in the northern hemisphere, at Paris †, the diminution in

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* *Conn. des temps pour* 1817, p. 330.

† I found in 1798, at Paris, conjointly with the Chevalier de Borda, in changing the poles several times, 69° 51′: M. Gay-Lussac obtained incl. 69° 12′ in 1806; M. Arago, incl. 68° 40′ in 1817; and in 1824, incl. 68° 7′. All these experiments were made with instruments of the same construction.

nineteen years (from 1798 to 1817), had been 1° 11′. My needle of inclination had made in the magnetic meridian at Paris, 245 oscillations in ten minutes time (Oct. 1796); I had seen the number of oscillations decrease, in proportion as we approached the magnetic equator. The number * at San Carlos del Rio Negro, (north latitude 1° 53′ 42″), was only 216. I then perceived the diminution of the intensity of the magnetic force from the pole to the equator. My surprise was so much the greater, when repeated observations yielded 246 oscillalations for the Havannah, which proved that the intensity of the force was greater in the western hemisphere at 23° 8′ latitude, than at Paris at 48° 50′. I have stated elsewhere that the *isodynamic lines* can in no way be confounded with the lines of *equal magnetic inclination;* and Captain Sabine † has just confirmed, by observations no doubt more precise than mine, the rapid increase of this force in equinoxial America. That able observer finds the intensity of the force at the Havannah and at London, in the oscillation of 1·72 : 1·62 (naming 1 the force at the magnetic equator near the island of St. Thomas, in the gulph of Guinea). The position of the north magnetic pole is such (lat. 60°, long. 82° 20′ west), that the polar distance of the Havannah is less than the polar distances of London and Paris. I found (January 4th, 1801) the magnetic dip at the Havannah, 6° 22′ 15″ east. Harris marks it at 4° 40′ in 1732. How can it be admitted that it does not change at Jamaica, since it undergoes so many variations in the island of Cuba?

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* *Per. Nar.*, vol. v, p. 396 and 693. These results require to be corrected relatively to the temperature.

† *Sabine,* Account of Exper. to determine the figure of the earth by pendulum experiments, 1825, p. 483, 494. The intensity of the magnetic forces is weaker at the magnetic equator, near the western coast of Africa, than near the western coast of South America. I obtained for the decrease of this force from the magnetic equator which passes between Micuipampa and Caxamarca (nearly south lat. 7° 1′ long. 80° 40′, height, 1500 toises) to Paris, the relation of 1·0000 : 1.3482. M. Sabine found the decrease from a

Extent, Territorial Division, Climate.—The island of Cuba being surrounded with shoals and breakers, for more than two-thirds of its length, and the navigation being made beyond those *dangers*, the real configuration of

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point of the magnetic equator, near St. Thomas (lat. 0° 5″ north, long. 4° 24′ east, height 3 t.), as far as London, in the relation of 1·00 : 1·62. MM. Biot and Hansteen had remarked, in comparing my experiments of oscillations with those of M. de Rossel, that, in the meridian of Surabaya, in the island of Java, the magnetic force was not so great as at Peru. (*Untersuchungen über den Magnetismus der Erde, Th. I,* 70.)

the island remained for a long time unknown. Its breadth, especially between the Havannah and the port of Batabano, has been exaggerated, and it is only since the *Deposito hidrografico* of Madrid, the finest establishment of the kind in Europe, has published the labors of the captain of a frigate, Don Jose del Rio, and of the lieutenant, Don Ventura de Barcaiztegui, that the *area* of the island of Cuba could be calculated with any exactness. The form of the isle of Pinos and the southern coast between Puerto Casilda and Cabo Cruz (behind the *Cayos de las doce leguas*) have assumed a very different aspect on our maps. M. de Lindeneau * found, according to the works which the Deposito had published as low down as 1807, the surface of the island of Cuba, without the neighbouring isles, to be 2255 geographical square leagues (15 to a degree); and with the surrounding isles, 2318 geographical square leagues. The latter result is equivalent to 4102 square marine leagues (20 to a degree). M. Ferrer, from materials somewhat different, fixed on 3848 square marine leagues †. In order to furnish in this work the most exact result that can be obtained in the present state of our astronomical knowledge, I engaged M. Bauza, who honors me with his friendship, and whose name is distinguished by great and solid labors, to calculate the *area* according to the map of the island of Cuba, in four sheets, which will soon be completed. He found, in June, 1825, the *surface of the island of Cuba, without the isle of Pinos*, to be 3520 *square marine leagues*, and with that isle, 3615. From this calculation, which has been twice repeated, it results, that the island of Cuba is one-seventh less than has hitherto been believed; that it is $\frac{32}{100}$ larger than Hayti, or Saint Domingo; that its surface equals that of Portugal, and nearly one-eighth that of England without Wales; and that if the whole archipelago of the Antilles presents as great an *area* as the half of Spain, the island of Cuba alone almost equals in surface the other Great and Little Antilles. Its greatest length, from cape Saint-Antonio to Point Maysi (in a direction from W.S.W.-E.N.E. and from W.N.W.-E.S.E.) is 227 leagues[*]; and its greatest breadth (in the direction N. and S.), from Point Maternillo to the mouth of the Magdalena, near Peak Tarquino, is 37 leagues. The mean breadth of the island, on four-fifths of its length, between the Havannah and Puerto Principe, is 15 leagues. In the best cultivated part, between the Havannah (lat. of

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* *Zach, Monatl Corresp.*, Dec. 1807, p. 312.

† Manuscript notes.

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[*] Marine leagues, 2854 toises, or 20 to a degree, when the contrary is not expressly marked. Don Felipe Bauza, in the calculation of the *area*, supposes the longitude of cape Saint-Antonio to be 87° 17′ 22″; the Morro of the Havannah, 84° 42′ 20″; the Batabano, 84° 46′ 23″; and the Punta Maysi (placing Porto-Rico, as Don Jose Sanchez Cerquero has done, at 68° 28′ 29″), 76° 26′ 28″. The longitude of the two former are at 3″ or 4″ of time, con-

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formably to my observations. (*Obs. astr.*, Tom. 1, p. 9, and *Per. Nar.*, vol. vii, p. 35.) The geodesic operations given me by Don Francisco Le Maur, an able engineer, who recently commanded the castle of San Juan d'Ulua, then at the Havannah (hotel of Count O'Reilly), are for Batabano, 84° 45′ 56″. M. Ferrer adopts for cape Maysi, 76° 30′ 25″, although he also persists in placing Porto-Rico at 68° 28′ 3″. (*Conn. des temps*, 1817, p. 323). I shall not here enlarge on the longitude of Porto-Rico which has already given rise to such warm discussions, and for which three correspondent observations of occultation of Aldebaran (Oct. 21, 1793) by M. Oltmanns, yielded 68° 35′ 43·5″, and the whole of the observations of occultation, distances, and transport of time, 68° 33′ 30″. (*Obs. astr.*, Tom. 2, p. 125 and 139). Ancient calculations, somewhat vague, gave the island of Cuba either 6764 *leguas planas ò legales españolas* (5000 varas or 26 $\frac{1}{6}$ to a degree), equal to 906,458 *caballerias* (of 432 square vares, or 35 English acres), according to the *Patriota Amer.*, 1812, Tom. 2, p. 292, and the *Docum. sobre el trafico de Negros*, 1814, p. 136; or, 52,000 square English miles (at 640 *acres* or $\frac{1}{11,97}$ square marine leagues). *Melish, Geogr.*, p. 444. *Morse, New System of Mod. Geogr.*, p. 238. In order to judge the more correctly of the territorial greatness of the island of Cuba, compared with the rest of the archipelago of the Antilles, I shall present the following table:

ISLANDS.	SURFACE IN SQUARE MARINE LEAGUES.	TOTAL POPULATION.	POPULATION BY SQUARE LEAGUES.
Cuba, according to M. Bauza - -	3615	715,000	197
Hayti, according to M. Lindenau -	2450	820,000	334
Jamaica - - - - - - - - -	460	402,000	874
Porto-Rico - - - - - - - - -	322	225,000	691
Great Antilles - - - - - - - -	6847	2,147,000	313
Little Antilles - - - - - - - -	940	696,000	740
Archipelago of the Antilles - - -	7787	2,843,000	365

the centre of the town 23° 8′ 35″) and the Batabano (lat. 22° 43′ 24″), the isthmus is only 8 marine leagues. We shall soon see that the proximity of the northern and southern coasts renders the port of Batabano highly important with respect to commerce and military defence. Among the great islands of the Globe, that of Java most resembles the island of Cuba in its form and area (4170 square leagues). Cuba has a circumference of coast of 520 leagues, of which 280 belong to the south shore, between cape Saint-Antonio and Point Maysi.

The island of Cuba, for more than four-fifths of its extent, is composed of low lands. The soil is covered with secondary and tertiary formations, formed by some rocks of gneiss-granite, syenite, and euphotide. The knowledge obtained hitherto of the geognostic configuration of the country, is as little exact as what is known of the relative age and nature of the soil. It is only ascertained that the highest groupe of mountains lies at the south-east extremity of the island, between Cabo-Cruz, Punta Maysi, and Holguin. This mountainous part, called the *Sierra* or *las Montañas del Cobre*, situated north-west of the town of Santiago de Cuba, appears to have 1200 toises * of absolute height. According to this supposition, the summits of the *Sierra* would command those of the Blue Mountains of Jamaica, and the peaks of la Selle and la Hotte, in the island of Saint Domingo. The *Sierra of Tarquino* *, fifty miles west of the town of Cuba, belongs to the same groupe as the *Copper Mountains*. The island is crossed from E.S.E. to W.N.W. by a chain of hills, which approach the southern coast between the meridians of la Ciudad de Puerto Principe, and the Villa Clara; while, more to the west, towards Alvarez and Matanzas, they stretch towards the northern coast. Going from the mouth of the Rio Guaurabo to the Villa de la Trinidad, I saw, on the north-west, the *Lomas de San Juan* †, that form needles or horns more than 300 toises high ‡, and of which the declivities go regularly towards the south. This calcareous groupe has

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* Are the *Montañas del Cobre* visible, as some pilots pretend, from the coast of Jamaica, or, which is more probable,

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from the northern declivity of the Blue Mountains? In the former case, their height would exceed 1600 toises, supposing a refraction of one-twelfth. It is certain that the mountains of Jamaica are perceived from the summit of the *Cuchillas*, or *Lomas* de Tarquino. (*Patriota americano*, Tom. 2, p. 282.)

* Lat. 19° 52′ 57″; long. 79° 11′ 45″, according to M. Ferrer.

† Lat. 21° 58′; long. 82° 40′.

‡ This estimate is founded on angles of height which I took at sea, at distances approximatively known.

a majestic aspect, seen from the anchorage near the Cayo de Piedras. Xagua and Batabano are low coasts; and I believe that in general, west of the meridian of Matanzas, there is no hill more than 200 toises high, with the exception of the Pan de Guaixabon. The land in the interior of the island, gently undulated as in England, rises only from 45 to 60 toises above the surface of the ocean *. The objects most visible at a distance, and most celebrated by navigators, are the Pan de Matanzas †, a truncated cone which has the form of a small monument; the *Arcos de Canasi*, which appear between Puerto Escondido and Jaruco, like small segments of a circle, the *Mesa de Mariel* ‡, the Tetas de Managua §, and the Pan of Guaixabon *. This decreasing level of the limestone formations of the island of Cuba towards the north and west, indicates the sub-marine connection of those rocks with the lands equally low of the Bahama Islands of Florida and Yucatan.

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* The village of Ubajay, at the distance of 15 marine miles from the Havannah, S. 25 W., at the absolute height of 38 toises; the line from the top of Bejucal to the Taverna del Reya, 48 toises.

† Height 197 toises. Lat. 23° 1′ 55″; long. 84° 3′ 36″, supposing with M. Oltmanns, the long. 84° 43′ 8″. I found, while sailing, the Arcos de Canasi 115 toises high.

‡ Middle of Guanajay, in the Mesa, lat. 22° 57′ 24″; long. 85° 0′ 20″. Torreon del Mariel, 85° 3′ 14″.

§ The astronomical position of two calcareous hills, called the Tetas de Managua, and situated S.W., is of great importance for the landing at the Havannah. I observed the latitudes, not at the foot of the eastern Teta, but at the village of Managua and at San Antonio de Barreto; and having linked the *Teta oriental* with those two places, I found the

Intellectual cultivation and improvement were so long restricted to the Havannah and the neighbouring districts, that we must not be surprised at the complete ignorance which we find respecting the geognosy of the *Montañas del Cobre*. A traveller, the pupil of M. Proust, and well versed in chemical and mineralogical science, Don Francisco Ramirez, told me that the western part of the island is granitic, and that he there recognized gneiss and primitive slate. It is probable that the alluvial deposits of *auriferous sand* which were explored with so

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Teta oriental de Managua to be lat. 22° 58′ 48″. M. Ferrer fixes it at 22° 58′ 19″; long. 84° 40′ 19″; and Captain Don Jose del Rio, at 84° 37′. M. Ferrer's calculation appears to me preferable; in the French copy of the map of Rio, the Tetas is placed at 84° 34′! The trigonometric operations of Francisco M. Le Maur assigns 84° 39′ 52″. M. Robredo finds the difference of latitude between the Mirador of the Marquès del Real Socorro, at the Havannah, and the Teta oriental de Managua, to be 8666,85 toises.

* Lat. 22° 47′ 31″; long. 85° 44′ 37″; height 390 toises. More to the west, on the southern coast, lies the Sierra de los Organos and Rosaio; at the south, that of Rio Puerco.

much ardour * at the beginning of the conquest, to the great misfortune of the natives, came

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* At *Cubanacan,* that is, in the interior of the island, near Jagua and Trinidad, where the auriferous sands have been borne by the waters as far as the limestone soil. (Manuscripts of Don Felix de Arrate, 1750, and of Don Antonio Lopez, 1802). Martyr d'Anghiera, the most intelligent writer on the *conquest,* says, (Dec. 3, Lib. 9, p. 24, D. and p. 63 D., ed. 1533) : "Cuba is richer in gold than Hispaniola (Hayti) ; and at the moment I am writing, 180,000 castillanos of ore have been collected at Cuba." If this estimate be not exaggerated, which I am inclined to believe, it would prove a product of working, and a robbery committed on the natives of 3600 marks of gold. *Herera* estimates the *quinto del Rey,* in the island of Cuba, at 6000 pesos, which indicates an annual product of 2000 marks of gold, at 22 carats, and consequently purer than the gold of Cibao of Saint Domingo. (*See,* on the value of the *castellanos de oro,* and the *peso ensayado* of the sixteenth century, my *Political Essay,* vol. iii, p. 365). In 1804, the whole mines of Mexico produced 7000 marks of gold; and those of Peru 3400. It is difficult to distinguish, in these calculations, between the gold sent to Spain by the first Conquistadores, that which is owing to washings, and that which had been accumulated for ages in the hands of the natives, who were pillaged at will. In supposing that the two islands of Cuba and Hayti (in the Cubanacan and the Cibao), that the product of the washings was 8000 marks of gold, we find a quantity three times less than the gold furnished annually (1790 to 1805) by the small province of Choco. In this supposition of ancient wealth there is nothing improbable; and if we are surprised at the penury of the gold washings attempted in our days at Cuba and Saint Domingo, which heretofore yielded such considerable quantities, it must be recollected

from those granitic formations; traces of that sand are still found in the rivers Holguin and Escambray, known in general in the vicinity of Villa-Clara, Santo Espiritu, Puerto del Principe,

that at Brazil also the product of the gold washings has fallen, from 1760 to 1820, from 6600 gold kilogrammes to less than 595. (*Per. Nar.*, vol. vi, p. 652). Pepites of gold weighing several pounds, found in our days in Florida and the two Carolinas, prove the primitive wealth of the whole basin of the Antilles, from the island of Cuba to the Monts Apallaches. It is also natural that the product of the gold washings should diminish with greater rapidity than that of the subterraneous working of the veins. No doubt the metals are now no more renewed in the clefts of the veins (by sublimation) that they accumulate in alluvial soil, by the course of the rivers where the table-lands are higher than the level of the surrounding running waters. But in rocks with metalliferous veins, the miner does not at once know all he has to work. He may chance to *lengthen* the labors, to go deep, and to cross other *accompanying veins.* Alluvial soils are generally of small thickness where they are auriferous; they most frequently rest upon sterile rocks. Their superficial position, and their uniformity of composition, facilitates the knowledge of their limits, and accelerates, wherever several workmen can be collected, and where the waters for the washings abound, the total drawing-off of the auriferous clay. These considerations, furnished by the history of the *conquest,* and by the science of the art of the miner, may throw some light on the problem of the metallic wealth of Hayti, which is now agitated. In that island, as well as at Brazil, it would be more profitable to attempt subterraneous workings (on veins) in primitive and intermediary soils, than to renew the gold washings, abandoned in the ages of barbarism, rapine, and carnage.

de Bayamo, and the Bahia de Nipe. Perhaps the abundance of copper mentioned by the Conquistadores of the sixteenth century *, at a period when the Spaniards were more attentive to the natural productions of America, than in later times, was owing to the formations of amphibolic slate, transition clay-slate mixed with diorite, and to euphotides, analogous to those I found in the mountains of Guanabacoa?

The central and western parts of the island contain two *formations of compact limestone*, one *of clayey sandstone*, and *another of gypsum*. The former of these formations has (not by its position and superposition, which are unknown to me, but by its aspect and composition) some resemblance to the Jura formation. It is white or of a clear ochre yellow, of a dull fracture, sometimes conchoide, sometimes smooth, divided in thin layers, furnishing some rognons of pyromac silex, often hollow, (Rio Canimar, two leagues east of Matanzas), and petrifications of pecten, cardites, terebatules, and madrepores †. I found no oolitic beds, but porous beds almost bulbous, between the

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* *Hai buen cobre in Cuba* (in the eastern part then visited). *Gomara, Hist. de Ind., fol.* xxvii.

† I saw neither gryphites, nor ammonites of Jura-limestone, nor the nummulites and cerites of coarse limestone.

Potrero del Conde de Mopox, and the port of Batabano, resembling the spungy beds of Jura-limestone in Franconia, near Dondorf, Pegnitz, and Tumbach. Yellowish cavernous strata, with cavities from 3 to 4 inches in diameter, alternate with strata altogether compact * and poorer in petrifications. The chain of hills that borders the plain of Guines towards the north, and is linked with the Lomas de Camaua, and the Tetas de Managua, belongs to the latter variety, which is reddish-white, and almost *lithographic*, like the Jura-limestone of Papenheim. The compact and cavernous beds contain nests of brown ocracious iron; perhaps the *red earth (tierra colorada)* so much sought for by the *planters (haciendados)* of coffee, is only owing to the decomposition of some superficial beds of oxidated iron, mixed with silex and clay, or to a reddish sandstone † superposed on limestone. The whole of this formation, which I shall designate by the name of the *limestone of Guines*, to distinguish it from another much more recent, forms near Trinidad, in the *Lomas of S. Juan*, steep declivities resembling the mountains of *Limestone of Caripe*, in the vicinity of Cumana [*]. They also contain great caverns, near Matanzas and Jaruco, where I have not heard that any fossil bones have been found. The frequency of caverns where the pluvial waters accumulate, and disappear in small rivers, sometimes causes a sinking of the earth [†]. I believe that the gypsum of the island of Cuba belongs not to tertiary, but to secondary soil; it is worked in several places on the east of Matanzas, at San Antonio de los Baños, where it contains sulphur, and at the Cayos, opposite San Juan de los Remedios. We must not confound with this (Jura?) limestone *of Guines*, sometimes porous, sometimes compact, another formation so recent, that it seems to augment in our days. I mean the *calcareous agglomerats*, which I saw in the *cayos* or islands that border the coast between the Batabano and the bay of Xagua, principally south of the Cienega de Zapata, Cayo Buenito, Cayo Flamenco, and Cayo de Piedras. The soundings prove that they are rocks rising abruptly from a bottom of 20 to 30 fathoms. Some are at the water's edge, others one-fourth or one-fifth of a toise above the surface of the sea. Angular fragments of madrepores, and cellularies from 2 to 3 cubic inches, are found cemented by grains of quartzous sand. The inequalities of the rocks are covered by a mold, in which, with a glass, we only distinguish the *detritus* of shells and corals. This tertiary formation no doubt belongs to that of the coast of Cumana, Carthagena, and the Great Land of Guadaloupe, of which I have spoken in my geognostic table of South America *. MM. Chamiso and Guiamard have recently thrown great light on the *formation of the coral islands* in the South Sea. When seated near the Havannah, at the foot of the Castillo de la Punta, on shelves of cavernous rocks †, and covered at the same time with verdant alves and living polypiers, we find enormous masses of madrepores and other lithophyte corals set in the texture of those shelves, we are at first tempted to admit, that the whole of this limestone rock, which constitutes the greater part of the island of Cuba, is owing to an uninterrupted operation of nature, to the action of productive organic forces, an action which continues in our days in the bosom of the ocean; but this appearance of the novelty of limestone formations soon vanishes, when we quit the shore, and recollect the series of *coral rocks* which contain the formations of different ages, the muschelkalk, the Jura limestone, and coarse limestone*. The same coral rocks as those of Castillo and la Punta are found in the lofty inland mountains,

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* The western part of the island having no deep ravins, we recognize this alternance in travelling from the Havannah to Batabano, the deepest beds (inclined from 30° to 40° N.E.) appearing as we advance.

† Sandstone and ferruginous sand; iron-sand?

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[*] *Per. Nar.*, vol. vi, p. 626.

[†] For instance, the tobacco mills of the ancient royal farm.

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* *See above*, vol. vi, p. 585. M. Moreau de Jonnès has also well distinguished, in his *Histoire physique des Antilles françoises* (Tom. 1, p. 136, 138, and 543), between the *Roche à Ravets* of Martinico and Hayti, which is porous, filled with terebratulites, and other vestiges of pelagic shells, somewhat analogous to the *limestone of Guines* of the island of Cuba, and the calcareous pelagic sediment called at Guadaloupe *Platine* or *Maçonne bon Dieu*. In the *Cayos* of the island of Cuba, or *Jardinillos del Rey y de la Reyna*, the whole coral rock which rises above the surface of the water, appeared to me to be fragmentary, that is, composed of broken blocks. It is probable, however, that in the depth, it reposes on masses of lythophyte polypiers still living.

† The surface of hese shelves, blackened and excavated by the waters, presents ramifications like the cauliflower, as

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they are observed on the currents of lavas. Is the change of colour produced by the waters owing to the manganese which we recognize by some dendrites? (Vol. v, p. 19, 305.) The sea, entering into the clefts of the rocks, and in a cavern at the foot of *Castillo del Morro,* compresses the air, and makes it issue with a tremendous noise. This noise explains the phenomena of the *baxos roncadores* (snoring bocabecos), so well known to navigators who cross from Jamaica to the mouth of Rio San Juan of Nicaragua, or to the isle of San Andrès.

* *See,* on the accumulation of corals in the coarse limestone of Paris, (limestone with cerites and nummulites), Brongniart, *Descr, géol. des env. de Paris,* p. 269, *Maraschini sulle format. del Vicentino,* p. 177.

accompanied with petrifications of bivalve shells, very different from those which are actually seen on the coasts of the Antilles. Without positively assigning a determined place in the table of formations to the *limestone of Guines*, which is that of Castillo and la Punta, I have no remaining doubt of the relative antiquity of that rock with respect to the *calcareous agglomerat of the Cayos*, situated south of Batabano, and east of the isle of Pinos. The globe has undergone great revolutions between the periods when these two *soils* were formed, one containing the great caverns of Matanzas, the other daily augmenting, by the agglutination of fragments of coral and quartzous sand. On the south of the island of Cuba, the latter of these soils seems to repose sometimes on (Jura) limestone of Guines, as in the Jardinillos, and sometimes (towards Cape Cruz) immediately on primitive rocks *. In the Little Antilles, the corals are covered with volcanic productions. Several of the *Cayos* of the island of Cuba contain fresh water, which I found very good in the middle of the *Cayo* de Piedras †. When we reflect on the extreme smallness of these islands, we can scarcely believe that the wells of fresh water are filled with rain-water not evaporated. Do they prove a sub-marine communication of the limestone of the coast with the limestone which serves for the basis of lithophyte polypiers, and is the fresh water of Cuba raised up by a hydrostatic pressure across the coral rocks of Cayos, as it is in the bay of Xagua, where, in the middle of the sea, it forms springs frequented by the lamantins?

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* I have already stated above, this indifference of superposition, vol. vi, p. 638, &c.

† According to my observations: lat. 21° 56′ 40″; long. 83° 37′ 12″. (*Obs. astr.*, Tom. 2, p. 111.)

The secondary formations on the east of the Havannah, are pierced in a singular manner by syenitic and euphotide rocks* united in groupes. The southern bottom of the bay as well as the north, (the hills of Morro and Cabaña), are of Jura limestone; but on the eastern bank of the two Ensenadas de Regla and Guanabacoa, the whole is transition soil. In going from north to south, and first near Marimelena, we find syenite composed of a great quantity of amphibol, partly decomposed, a little quartz, and a reddish-white feldspar seldom crystalized. This fine syenite, of which the strata are inclined to the north-west, alternates twice with serpentine. The layers of intercalated serpentine are three toises thick. Farther south, towards Regla and Guanabacoa, the syenite disappears, and the whole soil is covered with serpentine, rising in hills from 30 to 40 toises high, and running from east to west. This rock is much fendillated, externally of a bluish-grey, covered with dendrites of manganese, and internally of a leek and asparagus-green, crossed by small veins of asbestos. It contains no garnet or amphibole, but metalloide diallage disseminated in the mass. The serpentine is sometimes of an esquillous, sometimes of a conchoide fracture; this was the first time I had found metalloide diallage within the tropics. Several blocks of serpentine have magnetic poles; others are of such a homogeneous texture, and have such a succulent glossiness, that at a distance they may be taken for *pechstein* (resinite). It were to be wished that these fine masses were employed in the arts, as they are in several parts of Germany. In approaching Guanabacoa, we find serpentine crossed by veins from 12 to 14 inches thick, and filled with fibrous quartz, amethyst, and fine *mammelonnes*, and *stalactiforme* calcedoines; perhaps chrysoprase will also one day be found. Some copper pyrites appear among these veins, accompanied, it is said, by silvery-grey copper. I found no traces of this grey-copper;

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* A succinct description of this groupe, which I had written in Spanish, in 1804, with that of *Noticia mineralogica del Cerro de Guanabacoa communicada al Ex. Sr. Marques de Someruelos, Capitan General de la Isla de Cuba,* was published at the Havannah, (*Patriota Americano,* 1812, Tom. 2, p. 29.)

it is probably the metalloide diallage that has given the Cerros de Guanabacoa the reputation of riches in gold and silver, which it has enjoyed for ages. In some places, petroleum * runs out from rents in the serpentine. Springs of water are frequent; they contain a little sul-

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* Does there exist in the bay of the Havannah, any other source of petroleum than that of Guanabacoa, or must it be admitted that the *betun liquido*, which in 1508, served Sebastian de Ocampo, for the caulking of ships, is dried up? This spring, however, fixed the attention of Ocampo on the port of the Havannah, where he gave it the name of *Puerto de Carenas*. It is said that abundant springs of petroleum are also found in the eastern part of the island (*Manantialis de betun y chapapote*) between Holguin and Mayari, and on the coast of Santiago de Cuba. An islet has recently been discovered (Siguapa) near Punta Icacos, where nothing appears but solid earthy bitumen. This mass reminds us of the asphalte of Valorbe in the limestone of Jura. Is the formation of the serpentine of Guanabacoa repeated near Bahia Honda, in the Cerro del Rubi? On the hills of Regla and Guanabacoa, the botanists find at the foot of some scattered palm-trees, Jatropha panduræfolia, J. integerrima Jacq., J. fragrans, Petiveria alliacea, Pisonia loranthoïdes, Lantana involucrata, Russelia sarmentosa, Ehretia Havanensis, Cordia globosa, Convolvulus pinnatifidus, C. calycinus, Bignonia lepidota, Lagascea mollis Cav., Malpighia cubensis, Triopteris lucida, Zanthoxylum Pterota, Myrtus tuberculata, Mariscus Havanensis, Andropogon avenaceus Schrad., Olyra latifolia, Chloris cruciata, and a great number of Banisteria, of which the golden flowers embellish the landscape. (*See* our *Florata Cubæ Insulæ* in the *Nov. Genera* and *Spec.*, Tom. 7, p. 467).

phurated hydrogen, and deposit an oxid of iron. The Banos of Bareto are agreeable, but of nearly the same temperature as the atmosphere. The geognostic constitution of this groupe of serpentine rocks, from its insulated position, its veins, its connection with syenite, and its rising up across shell-formations, merits particular attention. Feldspar with a basis of souda (compact feldspar), forms, with diallage, the euphotide and serpentine; with pyroxene, dolerite and basalt; and with garnet, eclogite *. These five rocks, dispersed over the whole globe, charged with oxidulated and titanious iron, are probably of similar origin. It is easy to distinguish two formations in the euphotide; one is destitute of amphibol, even when it alternates with amphibolic rocks (Joria in Piedmont, Regla in the island of Cuba), rich in pure serpentine, in metalloide diallage, and sometimes in jasper (Tuscany, Saxony); the other, strongly charged with amphibol, often passing to diorite †, has no jasper in layers, and sometimes contains rich veins of copper, (Silesia, Mussinet

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* Renthberg, near Dolau (Bareuth), Saualpe (Styria).

† On a serpentine that flows like a *penombre*, veins of greenstone (diorite) near lake Clunie, in Perthshire. *See* Mac Culloch, in Edinb. Journ. of Science, 1824, July, p. 3-16. On a vein of serpentine, and the alterations it produces on the banks of Carlty, near West-Balloch in Forfarshire, *see* Charles Lyell, l. c., vol. iii, p. 43.

in Piedmont, the Pyrenees, Parapara in Venezuela, Copper Mountains of North America). It is the latter formation of euphotide which, by its mixture with diorite, is itself linked with hyperthenite, in which real beds of serpentine are sometimes developed in Scotland and Norway. No volcanic rocks of a more recent period have hitherto been discovered in the island of Cuba; for instance neither trachytes, dolerites nor basalts. I know not whether they are found in the rest of the Great Antilles, of which the geognostic constitution differs essentially from that of the series of calcareous and volcanic islands, which stretch from Trinidad to the Virgin Islands. Earthquakes, in general less fatal at Cuba than at Portorico and Hayti, are most felt in the eastern part, between cape Maysi, Santiago de Cuba, and la Ciudad of Puerto Principe. Perhaps towards those regions the action of the crevice extends laterally, which is believed to cross the neck of granitic land between Port-au-Prince and cape Tiburon, and on which whole mountains were overthrown, in 1770 *.

The cavernous texture of the limestone formations (*soboruco*) which we have just described, the great inclination of their shelves, the smallness of the island, the frequency, and nakedness of the plains, and the proximity of the mountains that form a lofty chain on the southern coast, may be considered as among the principal causes of the want of rivers, and the drought which is felt, especially in the western part of Cuba. In this respect, Hayti, Jamaica, and several of the Little Antilles, which contain volcanic heights covered with forests, are more favored by nature *. The lands most celebrated for their fertility, are the districts of Xagua, Trinidad, Matanzas, and Mariel. The valley of Guines owes its reputation to artificial irrigation (*sanjas de riego*). Notwithstanding the want of great rivers, and the unequal fertility of the soil, the island of Cuba, by its undulated surface, its continually renewed verdure, and the distribution of its vegetable forms, presents at every step the most varied and beautiful landscape. Two trees with large, tough, and glossy leaves, the Mammea and the Calophyllum Calaba, five species of palm-trees (the *Palma real*, or Oreodoxa regia, the common Cocoa-tree, the Cocos crispa, the Corypha Miraguama, and the C. maritima), and small shrubs constantly loaded with flowers, decorate the hills and the savannahs. The Cecropia peltata marks the humid spots. It would seem as if the whole island had been originally a forest of palms, lemons and wild orange trees. The latter, bearing a small fruit, are probably anterior to the arrival of the Europeans *, who transported thither the *agrumi* of the gardens; they rarely exceed the height of ten to fifteen feet. The lemon, and orange trees are most frequently separate; and the new planters, in clearing the ground by the means of fire, distinguish the quality of the soil, according as it is covered with one or other of those groupes of *social plants;* they prefer the soil of *naranjal* to that which produces the small lemon. In a country where the fabrication of sugar is not sufficiently improved to employ any other fuel than the *bagasse* (dried sugar-cane), the progressive destruction (*desmonte*) of the small woods is a real calamity. The aridity of the soil augments in proportion as it is stripped of the trees that sheltered it from the ardor of the sun, and of which the leaves, emitting heat under a sky always serene, occasion as the air cools, a precipitation of aqueous vapors.

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* Dupuget, in the *Journal des mines*, vi, p. 58, and Leopold de Buch, *Phys. Beschr, der Canar. Inseln*, 1825, p. 403.

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* *Hist. phys. des Antilles*, Tom. 1, p. 44, 118, 287, 295, 300.

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* See my Political Essay, vol. ii, p. 467. The best informed inhabitants of the island assert, that the cultivated orange-trees brought from Asia, preserve the size, and all the properties of their fruits when they become wild. (This is also the opinion of M. Gallesio, *Traitè de Citrus,* p. 32). The Brazilians have no doubt that the *small bitter orange* which bears the name of *loranja do terra,* and is found wild, far from the habitations of man, is of American origin. (*Caldcleugh, Travels in South Amer.,* vol. i, p. 25.)

Among the very small number of rivers worthy of attention, the Rio Guines may be noticed, which, in 1798, there was a project of joining to the *canal of small navigation*, which was to cross the island in the meridian of Batabano; the Rio Armendaris or Chorrera, of which the waters are led to the Havannah by the *Zanja de Antoneli*; Rio Canto, on the north of the town of Bayamo; the Rio Maximo which rises on the east of Puerto Principe; the Rio Sagua Grande, near Villa Clara; the Rio de las Palmas, which issues opposite Cayo Galiado; the small rivers of Jaruco and Santa Cruz, between Guanabo and Matanzas, navigable at the distance of some miles from their mouths, and favorable to the embarkment of sugar-casks; the Rio San Antonio, which, like many others, is ingulphed in the caverns of limestone rocks; the Rio Guaurabo, west of the port of Trinidad; and the Rio Galafre, in the fertile district of Filipinas, which throws itself into the Laguna de Cortez. The most abundant springs rise on the southern coast, where, from Xagua to Punta de Sabina, on a length of forty-six leagues, the soil is extremely marshy. The abundance of the waters which filter by the clefts of the stratified rock is such, that from the effect of an hydrostatic pressure, fresh water springs far from the coast, and amidst salt-water. The jurisdiction of the Havannah is not the most fertile; and the few sugar-plantations that existed in the vicinity of the capital, are now replaced by farms for cattle *(potreros)*, and fields of maize and forage, of which the profits are considerable on account of the consumption of the town. The agriculturists of the island of Cuba distinguish two kinds of earth, often mixed together like the squares of a draught-board, black earth *(negra ou prieta)* clayey and full of moisture, and red earth *(bermeja)*, more silicious, and mixed with oxid of iron. The *tierra negra* is generally preferred, on account of its best preserving humidity, for the cultivation of the sugar-cane, and the *tierra bermeja* for coffee; but many sugar plantations are established on the red soil.

The *climate of the Havannah* corresponds to the extreme limits of the torrid zone: it is a tropical climate, in which a more unequal distribution of heat at different parts of the year, denotes the passage to the climates of the temperate zone. Calcutta (lat. 23° 8′ N.), Macao (lat. 22° 12′ N.), the Havannah (lat. 23° 9′ N.), and Rio Janeiro (lat. 22° 54′ S.) are places which from their position, at the level of the ocean, near the tropics of Cancer and Capricorn, consequently at an equal distance from the equator, are of great importance for the study of meteorology. This study can only advance by the determination of certain *numerical elements,* which are the indispensible basis of the laws we seek to discover. The aspect of the vegetation being identic towards the limits of the torrid zone, and at the equator, we are accustomed to confound vaguely the climates of two zones comprized between 0° and 10°, and between 15° and 23° of latitude. The region of palm-trees, bananas, and arborescent gramina extends far beyond the two tropics: but it would be dangerous (as was done recently on the death of Dr. Oudney, in discussing at what elevation of soil ice could have been formed in the kingdom of Bornou) to apply what has been observed at the extremity of the tropical zone, to what may take place in the plains near the equator. In order to rectify those errors, it is important that the mean temperature of the year and months be well known, as also the thermometric oscillations in different seasons at the parallel of the Havannah; and to prove by an exact comparison with other points alike distant from the equator, for instance, with Rio Janeiro and Macao, that the great lowering of temperature observed in the island of Cuba is owing to the irruption, and the stream of layers of cold air borne from the temperate zones towards the tropics of Cancer and Capricorn. The mean temperature of the Havannah, according to four years of good observations, is 25·7° (20·6° R.), only 2° cent. above that of the regions of America nearest the equator *. The proximity of the sea raises the mean temperature of the year on the coast; but in the interior of the island, when the north winds penetrate with the same force, and where the soil rises to the height of forty toises †, the mean temperature attains only 23° (18·4° R.), and does not surpass that of Cairo and Lower Egypt. The difference between the mean temperature of the hottest and coldest months, rises to 12° in the interior of the island; at the Havannah, and on the coast, to 8°; at Cumana, to scarcely 3°. The hottest months, July and and August, attain 20·8°, at the island of Cuba, perhaps 29.5° of mean temperature, as at the equator. The coldest months are December and January; their mean temperature, in the interior of the island, is 17°; at the Havannah, 21°, that is 5° to 8° below the same months at

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* Mean temperature of Cumana (lat. 10° 27′) 27·7° cent. It is asserted that in the Little Antilles, at 13° and 16° of latitude, we find for Guadaloupe 27·5°; for Martinico, 27·2°; for Barbadoes, 26·3°. *Hist. Phys., des Antilles,* tom. i, p. 186.

† Scarcely six toises more than the height of Paris (first floor of the Royal Observatory) above the level of the sea.

the equator, yet still 3° above the hottest month at Paris. With respect to the extreme temperature *, which the centigrade thermometer attains in the shade, we observe, towards the limit of the torrid zone, what characterizes the regions nearest the equator (between 0° and 10° of north and south latitude); the thermometer, which has been seen at Paris at 38·4° (30.7° R.), rises only to 33° at Cumana; at Vera Cruz, it was but once at 32° (25·6° R.) during thirteen years; and M. Ferrer saw it oscillate at the Havannah, only between 16° and 30° in the space of three years (1810-1812). Mr. Robredo mentions, in his manuscript notes in my possession, as very remarkable, that the temperature rose, in 1801, to 34·4° (27·5° R.); while at Paris, according to the curious researches of M. Arago, the extremes of temperature between 36·7° and 38° (29·4° and 30·7° R.) were attained four times in ten years (from 1793 to 1803). The nearness of the two periods, when the sun passes by the zenith of places situated towards the extremity of the torrid zone, often produces intense heat on the shore of Cuba and in the country comprised between the parallels of 20°

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* M. Lachenaie asserts that, in 1800, he saw the centesimal thermometer rise in the shade (at Saint Rose, in the island of Guaduloupe,) to 39° 3′; but we are ignorant if his instrument was exact, and free from the effects of reflection. The extremes at Martinico are 20° to 35°.

and 20½°, less for whole months than for some successive days. The thermometer does not rise in August (common year), above 28° to 30°: the excessive heat is complained of when it rises to 31° (24·8° R.). The lowering of the wintry temperature to 10° or 12° is rare; but when the north wind blows during several weeks, and brings the cold air of Canada, ice is sometimes formed during the night, in the interior of the island, in the plain at a small distance from the Havannah *. According to the observations of MM. Wells and Wilson, we may admit that the reflexion of the caloric produces this effect, when the thermometer keeps up at 5°, and even 9° above the freezing point; but M. Robredo assured me he had seen the thermometer at zero. This formation of thick ice almost at the level of the sea, in a spot which belongs to the torrid zone, is the more remarkable, as at Caraccas (lat. 10° 31′), and at 477 toises high, the atmosphere does not cool below 11°; and that nearer the equator, we must ascend 1400 toises to find ice †. It may be observed further, that between the Havan-

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* This accidental cold was remarked by the first travellers. "En Cuba," says Gomára, "algo se siente el frio." *Hist. of the Indies*, fol. 27.

† We do not find any, even at Quito (1490 toises), situated in a narrow valley, where a sky, often cloudy, diminishes the force of reflection.

nah and Saint Domingo, and between Batabano and Jamaica, there is a difference of only 4° or 5° of latitude; and at Saint Domingo, Jamaica, Martinico, and Guadaloupe, the *minima* of temperature in the plains * is from 18·5° to 20·5°.

It will be interesting to compare the climate of the Havannah with that of Macao and Rio Janeiro; two spots, one of which is placed near the limit of the northern torrid zone; one on the eastern coast of Asia, and the other on the *eastern* coast of America, towards the extremity of the *southern* torrid zone. The mean temperature of Rio Janeiro is deduced from 3500 observations made by M. Benito Sanchez Dorta; and that of Macao from 1200 observations communicated to me by the Abbé Richenet †.

	HAVANNAH.	MACAO.	RIO JANEIRO.
	lat. 23° 9' N.	lat. 22° 12' N.	lat. 22° 54' S.
Mean temp. of the year	25·7°	23·3°	23·5°
of the hottest month	28·8°	28·4°	27·2°
of the coldest month	21·1°	16·6°	20·0°

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* The observation of 18·5° is by M. Hapel Lachenaie. M. Dru also asserts that he never saw the thermometer descend at Portorico lower than to 18·7°; but he believes that snow falls on the mountains of Loquillo in the same island!

† When I shall have compared the registers of this respectable and studious ecclesiastic, the partial results of Macao may undergo some slight changes. *See* above, vol. vi, p. 750.

The climate of the Havannah, notwithstanding the frequency of the north and north-west winds, is hotter than that of Macao, and Rio Janeiro. The former participates in the cold which, on account of the frequency of the west winds, is felt in winter along all the eastern coast of a great continent. The proximity of great spaces of land, covered with mountains and table-lands, renders the distribution of heat in the different months of the year, more unequal at Macao and Canton, than in an island circled on the west and north by the hot waters of the Gulf-stream. The winters are therefore much colder at Canton and Macao than at the Havannah. The mean temperature at Canton, of December, January, February, and March, in 1801, was between 15° and 17·3° cent.; and at Macao, between 16·6° and 20°, while at the Havannah it is generally between 21° and 24·3°: yet the latitude of Macao is 1° more southerly than that of the Havannah; and the latter town and Canton are within nearly a minute on the same parallel. Now, although the isotherme lines, or lines of equal heat, have a *concave* summit towards the pole in the *system of the climates of eastern Asia*, as in the *system of eastern America*, the cooling, on the same geographical parallel, is however, most considerable on the side of Asia *. The Abbe Richenet, who during nine years (1806-1814), made use of the excellent thermometer of *maxima* and *minima* of six, observed that the instrument descends to 3.3° and 5° (38° and 41° Fahr.) The thermometer at Canton sometimes almost reached the point zero, and by the effect of reflection, ice is found on the terraces of houses. Although this great cold never lasts more than one day, the English merchants residing at Canton, like to make chimney-fires in their apartments from November to January; while at the Havannah, no want is felt of being warmed even by a *brazero*. Hail is frequent, and extremely large in the Asiatic climate of Canton and Macao, while it is scarcely seen once in fifteen years at the Havannah. In these three places the thermometer sometimes keeps up for several hours between 0° and 4° cent.; and yet, (which appears to me very remarkable), snow has never been seen to fall; and notwithstanding the great lowering of the temperature, the banana and the palm-trees display as beautiful a vegetation around Canton, Macao, and the Havannah, as in the plains nearest the equator.

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* Such is the difference of *climate* on the eastern and

western coast of the ancient continent, that at Canton (lat. 23° 8′), the mean temperature of the year is 22·9°, while at Saint Croix of Teneriffe (lat. 28° 28′) it is, according to MM. de Buch and Escolar, 23·8°. Canton, situated on an eastern coast, participates of the *continental climate.* Teneriffe is an island near the western coast of Africa.

It is fortunate for the study of meteorology, that in the present state of civilization, so many numerical elements can be collected on the climate of places situated almost immediately within the two tropics. Five of the largest towns of the commercial word, Canton, Macao, Calcutta, the Havannah, and Rio Janeiro, are in that position. In the northern hemisphere, Mascate, Syene, Nuevo Santander, Durango, and the most northerly of the Sandwich islands; and in the southern hemisphere, Bourbon, the Isle of France, and the port of Cobija, between Copiapo and Arica, are places frequented by Europeans, and which furnish naturalists with the same advantages of position as Rio Janeiro and the Havannah. Climatology makes slow progress, because results obtained on points of the globe where human civilization begins to develope itself, are accumulated by chance. Those points form small groupes separated from each other by immense spaces of *land unknown* to meteorologists. In order to ascertain the laws of nature in the distribution of heat on the globe, we must give our observations a direction conformable to what a new science requires, and know what numerical statements are the most important. Nuevo Santander, on the eastern coast of the gulph of Mexico, has probably a mean temperature lower than that of the island of Cuba. The atmosphere must participate in the wintry cold of a great continent which widens towards the north-west. If, on the contrary, we quit the system of the climates of eastern America, if passing over the basin or rather the submerged valley of the Atlantic, we fix our regards on the coast of Africa, we find, in *the system of cisatlantic climates,* on the *western* shore of the antient continent, the raised isotherme lines, convex towards the poles. The tropic of Cancer passes between cape Bojador and cape Blanc, near the Rio de Ouro, on the inhospitable bounds of the desert of Sahara; and the mean temperature of those places must be far above that of the Havannah, on account of their position on an *oriental coast,* and also of the proximity of the desert, which reflects the heat, and spreads the molecules of sand through the atmosphere.

We have seen that the great lowerings of the temperature in the island of Cuba are of such short duration, that neither the bananas, the sugar-cane, nor other productions of the torrid zone, suffer habitually on that account. We know how well plants of vigorous organization resist temporary cold, and that the orange trees and bigaradiers of the river of Genoa survive the fall of snow, and cold which does not extend 6° or 7° below the freezing point *. As the vegetation of the island of Cuba bears the character of the vegetation of regions nearest the equator, we are surprized to find even in the plains, a vegetable form of the temperate climates, and mountains of the equatorial part of Mexico. I have often in other works fixed the attention of botanists on this extraordinary phenomenon in the geography of plants. The pines (pinus occidentalis) are not found in the Little Antilles; not even in Jamaica (between 17¼° and 18½° of latitude), according to Mr. Robert Brown, notwithstanding the elevation of the soil of that island in the Blue Mountains. They are only seen further north, in the mountains of Saint Domingo, and in the whole island of Cuba *, extending between the parallels

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* Gallesio, p. 55.

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* M. Barataro, the learned pupil of professor Balbis, whom I consulted on the stations of the pinus occidentalis of Saint Domingo, assured me that near cape Samana (lat. 19° 18′), he saw that tree in plains, amidst other plants of hot regions, and that in general it is found at Saint Domingo and Porto Rico on mountains of small height, and not on the most lofty. The pines of Cuba and the isle des Pinos, south of Batabano, are, according to the relation of travellers, real pines with imbricated cones, similar to the pinus occidentalis Swarz, and not podocarpus, as I had for some time suspected. The first Spaniards who visited the West Indies have sometimes confounded the pines and the podocarpus; and a passage of Herera (Decad. i, p. 52), proves indubitably that the *Pinos del Cibao,* mentioned by Columbus in his second voyage, were coniferes with monocarpe fruit, real

from 20° to 23. They attain a height of 60 to 70 feet; and it is remarkable, that the *Cahoba** (mahogany), and pines vegetate at the island of Pinos, in the same plains. We also find pines towards the south-east of the island of Cuba, on the declivity of the Copper mountains, where the soil is barren and sandy. The interior table-land of Mexico is covered with the same species of coniferous plants; at least the specimens brought by M. Bonpland and myself from Acaguisotla, Nevado de Toluca, and Cofre de Perote, do not appear to differ specifically from the pinus occidentalis of the West

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podocarpus. "*Estos Pinos mui altos,* says the Admiral, *que no llevan piñas* (the cones of the pine), *son por tal orden compuestos por naturaleza que parecian aceitunas del Alxarafe de Sevilla.*" I have already remarked, in presenting the first description of Bertholletia, according to Laet (vol. v, p. 537), how simple and characteristic were the descriptions of the ancient travellers, who had not the rage of employing technical terms of which they were ignorant of the value. Were the pines of the isles of Guanaja and Rattan (in 16½° of latitude), which served to make masts, podocarpus, or of the pinus kind? (Herera, Dec. i, p. 131; Laet, Orb. Nov., p. 341; Juarros, Hist. de Guatemala, tom. ii, p. 169; *Tuckey,* Maritime Geography, vol. iv, p. 294). We know not if the name of the isle of Pinos, situated 8° 57′ of latitude east of Portobello, is founded on the error of the first navigators. Between the parallels of 0° and 10° in equinoxial America, I saw no podocarpus descend below 1100 toises of height.

* Swieteni Mahogany L.

India Islands, described by Swartz. Now, those pines which we see at the level of the ocean in the island of Cuba, in 10° and 22° of latitude, and which belong only to the southern part of that island, do not descend on the Mexican continent between the parallels of 17½° and 19½°, below the elevation of 500 toises. I even observed that, in the road from Perote to Xalapa, in the eastern mountains opposite the island of Cuba, the limit of the pines is 935 toises; while in the western mountains, between Chilpanzingo and Acapulco, near Quasiniquilapa, two degrees further south, it is 580 toises, and perhaps on some points, 450. These anomalies of stations are very rare in the torrid zone, and are probably less connected with the temperature * than with the nature of the soil. In the system of the migration of plants, we must suppose that the pinus occidentalis of Cuba came from Yucatan before the opening of the channel between Cape Catoche and Cape Saint Antonio, and not from the United States, so rich in coniferous plants; for the species of which we here trace the botanical geography, has not been discovered in Florida.

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* *See* a table of the stations of the coniferous plants and the amentacies, with an indication of the temperature they require, in the *Nov. Gen.* and *Spec.*, tom. ii, p. 26. No pines have yet been found near Xalapa, on the eastern declivity of the Mexican table-land, at 700 toises high, although the thermometer there descends below 12° cent.

I shall here note in detail the observations of temperature made at the island of Cuba:

OBSERVATIONS ON UBAJAY.

MONTHS.	1796. F.	1797. F.	1798. F.	1799. F.	MEAN in centesimal degrees.
January - - -	65°	64°	68°	61°	18
February - - -	71	66	69	63	19·5
March - - -	71	64	68½	64	19·3
April - - - -	74	68	70	68	21·1
May - - - -	78½	77	75	76	24·7
June - - - -	80	81	83	85	27·8
July - - - -	82½	80	85	87	28 6
August - - -	83	84	82	84	28·4
September - -	81	81½	80	76	26·4
October - - -	78	75½	79½	73	24·5
November - -	75	70	71	61	20·6
December - -	63	67½	60	59	16·7
Mean of the year	75·2°	73·2°	74·2°	71·4°	23·0°

The village of Ubajay is situated, as we have observed above, at the distance of 5 marine leagues from the Havannah, on a table-land 38 toises above the level of the sea. The partial mean of December 1795, was 18·8° cent.; that of January and February, 1800, rose from 13·8° to 18·9° (Thermometer constructed by Nairne).

Obs. at the Havannah.

MONTHS.	1800. Th. cent.	MEAN of 1810-1812.
January...	...	21·1°
February..	...	22·2
March.....	21·1	24·3
April......	22·7	26·1
May........	25·5	28·1
June.......	30·0	28·4
July........	30·3	28·5
August....	28·3	28·8
September	26·1	27·8
October...	26·6	26·4
November	22·2	24·2
December	23·8	22·1
Mean......	25·7	25·7

	Ubajay, interior of the isle of Cuba.	Havannah, coast.	Cumana, lat. 10° 27′
Dec.-Feb.........	18·0° cent.	21·8°	26·9°
March-May......	21·7	26·2	28·7
June-August.....	28·2	28·5	27·8
Sept.-Nov........	23·8	26·1	26.8
Mean temperature	22·9	25·7	27·6
Coldest month	16·7	21·1	26·2
Hottest month	28·6	28·8	29·1

Rome, lat. 41° 53″ t. mean 15·8°.

Hottest month......	25·0°
Coldest month	5·7°

This is the real mean deduced from the *maxima* and *minima* of each day; yet the results of Don Antonio Robredo, made at the village of Ubajay and at the Havannah (1800), are perhaps some tenths too high, three diurnal observations (at 7 in the morning, noon, and 10 in the evening) having been simultaneously employed. The mean of M. Ferrer, to whom we owe the observations of three years, 1810, 1811, and 1812 (*see* above, vol. vi, p. 748), are the most exact we possess on the climate of the Havannah, the instruments of that able navigator having been better exposed during ten months of 1800, than those of M. Robredo. The latter remarks himself, that "the current of air was not sufficiently free in his apartment at the Havannah (*priza no mug ventilades*), while the exposure at Ubajay was all that could be desired, *(un lugar abierto á todos vientos, pero cubierto contra el sol y la lluvia)*. I saw the centigrade thermometer in the latter half of December, 1800, constantly between 10° and 15°. It lowered in January, at the Hacienda del Rio Blanco, to 7·5°. Water was sometimes frozen some lines thick in the country, near the Havannah, at the height of 50 toises above the level of the Ocean. This observation was communicated to me by M. Robredo, in 1801, and was repeated in December, 1812, after impetuous north winds had blown nearly a month.

As snow falls in Europe, when the temperature in the plains is some degrees above the freezing point, we may be surprised that in no part of the island, not even on the Lomas of San Juan, nor on the lofty mountains of Trinidad, snow is seen to fall. Nothing is observed on the summit of these mountains, and those of del Cobre, but hoar-frost (*escarcha*). It would seem that in the high regions of the air it acquires other conditions than that of a rapid lowering of the temperature, to produce a fall of snow or hail. We have already observed above, that the latter is never seen (vol. iv, p. 538; vol. vi, p. 785) at Cumana, and so rarely at the Havannah, that it is only observed during electric explosions, and with blasts from the S.S.W., once in fifteen or twenty years. On the coast of Jamaica, at Kingston, the thermometer lowering at sun-rise to 20·5° (69° F.), is mentioned as an extraordinary phenomenon *. In that island, we must ascend the Blue Mountains 1150 toises, to see it (August) at 8·3°: I did not observe the thermometer lower at Cumana, at 10° of latitude, than 20·8° (vol. vi, p. 781). The changes of the temperature are very sudden at the Havannah; the variations were in three hours, in the shade, from 32·2° to 23·4°, consequently 9° cent., which is very considerable for the torrid zone, and double the change felt further south, on the coast of Columbia. At the Havannah (lat. 22° 8′), the inhabitants complain of cold when the temperature descends rapidly to 21°; at Cumana (lat. 10° 28′), when it descends to 23° (vol. vi, p. 781). Water that had been exposed to a strong evaporation, and was considered as quite fresh at the Havannah, in April 1804, was at 24·4° (19·5° R.), while the mean temperature of the day rose to 29·3° (vol. vi, p. 785). During the three years of M. Ferrer's observations (1810-1812), the thermometer never sank below 16·4° (20th February, 1812), nor rose above 30° (August 4th, same year). I saw it in April (1801), at 32·2°, but in a long succession of years, the temperature of the atmosphere does not once rise to 34° (27·2° R.), an extreme which in the temperate zone, it surpasses 4 centesimal degrees (vol. vi, p. 781). It would be very interesting to collect good observations on the heat of the interior of the earth, at the extremity of the tropical zone. I found it in the caverns of calcareous rock, near San Antonio de Beitia, and at the sources of the Rio Chorera, to be between 22° and 23° (*Rec. d'Obs. astr.*, Tom. i, p. 134). M. Ferrer found it in wells 100 feet deep, 24·4°. These observations, not made perhaps in circumstances sufficiently favorable, would indicate a temperature of the earth below the mean temperature of the air, which, on the coast of the Havannah, appears to be 25·7°; and in the interior of the island, at 40 toises elevation, 23°. This result is little conformable to what is every where observed in the temperate and frozen zones. Do the currents which bear at great depths the water of the poles towards the equatorial regions, diminish the temperature of the interior of the earth in small islands? We have already treated this delicate question in relating the experiments made in the cavern of Guacharo, near Caripe (vol. iii, *Per. Nar.*, p. 115 and 155). Yet, it is affirmed, that in the wells of Kingston and the Low-land of Guadaloupe, the thermometer has been seen at 27·7°; 28·6°, and 27·2°, consequently, at a temperature at least equal to the mean temperature of the air in those places.

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* Edwards, Hist. of the British Colonies, 1793, vol. i, p. 183.

The great lowering of the temperature to which countries are exposed situated at the extremity of the torrid zone, is connected with the oscillations of the mercury in the barometer, which is not observed in regions near the equator. At the Havannah, as at Vera-Cruz, the regularity of the variations of the pressure of the atmosphere, at certain hours, is interrupted when the north-winds blow with violence. I observed that in general, at the island of Cuba, when the barometer kept up during the breeze, at 0·765m, it lowered with the south-winds to 0·756m, and even below. We have elsewhere remarked, that the barometric mean of the months when the barometer is highest (December and January), differs from the mean of the months when the barometer is lowest (August and September), 7 to 8 millimeters, that is, almost as much as at Paris, and 5 or 6 times more than between the equator and the 10° of north and south latitude.

Mean of December…	0·76656m by	22·1° cent. of temperature.
January……	0·76809	21·2
July………	0·76453	28·5
August……	0·76123	28·8

During the course of three years in which M. Ferrer took the mean *, the extreme difference of the days when the mercury in the barometer rose or fell most, exceeded 30 millimeters. In order to shew the progress of the accidental oscillations of each month, I shall here subjoin, according to the manuscript notes of Don Antonio Robredo, the table † of observations of 1801, expressed in centimes of English inches.

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* *See* above, vol. vi, p. 749.

† In this table, the mean of the months is the real mean drawn from the *maxima* and *minima* of each day. The *extremes* of the month indicate the barometric heights of two days when the barometer was at the highest and owest. The heights are not reduced to the temperature of

	MAXIMA.	MINIMA.	MEAN.	MEAN TEMP.
January	30·35$^{\text{in}}$	29·96$^{\text{in}}$	30·24$^{\text{in}}$	14·5$^{\text{in}}$ R.
February ...	30·38	30·01	30·26	15·6
March	30·41	30·20	30·32	15·5
April	30·39	30·32	30·35	17·2
May.........	30·44	30·38	30·39	19·4
June.........	30·36	30·33	30·34	22·2
July.........	30·38	29·52	30·22	22·4
August......	30·26	30·12	30·16	22·8
September .	30·18	29·82	30·12	21·0
October	30·16	30·04	30·08	18·6
November .	30·18	30·09	30·12	16·5
December .	30·26	30·02	30·08	12·1

Hurricanes are much more rare in the island of Cuba than at Saint Domingo, Jamaica, and the Little Antilles, situated east and south-east of Cabo-Cruz; for we must not confound the violent blasts of north-wind (*los nortes*) with the hurricanes which are most frequently from south-south-east and south-south-west. At the period when I visited the island of Cuba, there had been no hurricane, properly so called, since the month of August, 1794, for that of the 2d of November 1796, was feeble. The season of these sudden and frightful movements of the atmosphere, during which the wind blows from every point of the compass, and which are often attended with lightning and hail, is at Cuba,

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zero, and the level of the bason was not rectified, the table being only intended to furnish the differences of the extremes of every month, and not the absolute mean heights.

the end of August, the month of September, and especially the month of October. At Saint Domingo and the Carib Islands, the months of July, August, September, and the middle of October, are most dreaded by navigators. The most frequent hurricanes are there felt in the month of August; so that this phenomenon appears later in proportion as we advance towards the west. Most impetuous blasts of wind from the south-east, are sometimes felt in March, at the Havannah. The periodical regularity of hurricanes is no longer believed in the West Indies *; from 1770 to 1795, seventeen were felt in the Carib Islands; while not one took place at Martinico from 1788 to 1804. That island reckoned three during the course of the year 1642. It is worthy of remark, that at the two extremities of the long chain of the West Indies, S.E. and N.E. hurricanes are the most rare. The islands of Tobago and Trinidad never felt their effects; and at Cuba, those violent ruptures of the atmospheric equilibrium seldom happen. When they arrive, they exercise their ravages more at sea than in the devastation of the habitations, and more on the south and south-east coast, than towards the

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* *See* the description of this important phenomenon in the *Hist. phys. des Antilles,* Tom. i,p. 325, 350, 355, 376, 387.

north and north-west *. In 1527, the famous expedition of Pamfilo Narvaez was partly destroyed in the port of Trinidad of Cuba.

I shall here state, from the manuscript notes of the captain of a ship, Don Tomas de Ugarte, the movements of the barometer during the hurricane of the 27th and 28th August, 1794, which occasioned the loss of many ships in the bay of the Havannah.

		IN.
25th August	16^{h}...	30·04
	20 ...	03
	noon	02
(Mean tempera-	4 ...	02
ture 85·8° Fahr.)	8 ...	01
	mid. .	01
26th August	16^{h}...	30·00
	20 ...	00
(Mean temp. 88°)	noon.	00
	4 ...	29·99
	mid. .	98
27th August	16^{h}...	29·95
	18 ...	94
	20 ...	90
(Mean temp. 81°)	22 ...	89
	noon	86
	2 ...	84
	4 ...	82
	6 ...	80
27th August	7^{h}...	29·80
	8 ...	79
	10 ...	77
	10½ ..	76
	11 ...	73
	11½ ..	69
	mid. .	63
28th August	12½^{h} .	29·59
	13 ...	58
	13½ ..	57
	14 ...	56
	14½ ..	54
	15 ...	52
	15½ ..	50
	16 ...	51
	18 ...	52
(Mean temp. 83°)	18½ ..	54
	19 ...	59
	19½ ..	63

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* This difference between the two coasts is also observed at Jamaica.

		IN.			IN.
28th August	20^{h}...	29·67	28th August	$3\frac{1}{2}^{h}$...	29·83
	20½ ..	70		6 ...	84
	21 ...	72		7 ...	87
	21½ ..	74		8 ...	89
	22 ...	75		9 ...	90
	22½ ..	76		10 ...	93
	noon	78		11 ...	96
	2 ...	79		mid. .	30·01
	2½ ..	82			

The hurricane commenced on the 27th in the morning; its force augmented in proportion as the barometer went down; it ended in the evening of the 28th. We have related above that M. Ferrer saw his barometer, (which marked 26° cent. of temperature for the mean height of the year 763·71^{mm}) descend, October 25th, 1810, by a furious S.S.W. wind, to 744·72^{mm} by 24° cent.

I might enumerate among the causes of the lowering of the temperature during the winter months, the great number of shoals with which the island of Cuba is surrounded, and on which the heat is diminished several degrees of centesimal temperature, either by the mollecules of water locally cooled which go to the bottom, or by the polar currents which are borne toward the abyss of the tropical ocean, or by the mixture of the deep waters with those of the surface at the declivities of the banks*; but this lowering of the temperature is partly compensated by the flood of hot-water, the gulph-stream, which runs along the north-west coast, and of which the swiftness is often diminished by the north and north-east winds. The chain of shoals which encircles the island, and appears on our maps like a penumbra, is happily interrupted on several points, and those interruptions afford a free access to the coast. In general, the parts of the island most exempt from danger (breakers, sand-banks, rocks) are on the south-east, between Cabo-Cruz and Punta Maysi (72 sea-leagues); and north-west, between Matanzas and Cabañas (28 l.). In the south-east part, the proximity of the lofty primitive mountains renders the coast more precipitous; there are the ports of Santiago de Cuba, Guantanamo, Baitiqueri, and (in turning the Punta Maysi) Baracoa. The latter port is the place most anciently peopled by the Europeans. The entrance of the Old Channel, from Punta de Mulas, W.N.W. of Baracoa, as far as the new settlement which has taken the name of Puerto de las Nuevitas del Principe, is alike free from shelves and breakers. Navigators find excellent anchorage a little to the east of Punta de Mulas, in the three rocks of Tanamo, Cabonico, and Nipe; and on the west of the Punta de Mulas, in the ports of Sama, Naranjo, del Padre, and Nuevas Grandes. It is remarkable, that near the latter port, almost in the same meridian where on the southern side of the island we find the shoals of *Buena Esperanza* and of *las doce leguas*, stretching as far as the isle of Pinos, the uninterrupted series begins of the Cayos of the Old Channel; it extends on a length of 94 leagues, from Nuevitas to Punta Icacos. The Old Channel is narrowest opposite to Cayo Cruz and Cayo Romano; its breadth is scarcely 5 to 6 leagues. It is on this point also that the Great Bank of Bahama takes the greatest development. The Cayos nearest the island of Cuba, and those parts of the bank that are not covered with water (Long Island, Eleuthera) are, like Cuba, of a lengthened form. An island much larger than Hayti would appear at the surface of the Ocean, if it were to lower only from 20 to 30 feet. The chain of breakers and cayos that bound the navigable part of the Old Channel towards the south, leave between the Channel and the coast of Cuba, small basins without breakers, which communicate with several ports with good anchorage, such as Guanaja, Moron, and Remedios.

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* *See* above, vol. i, p. 29; vol. ii, p. 56; vol. iii, p. 158.

After having passed by the Old Channel, or rather by the Channel of Saint Nicolas, between Cruz del Padre and the bank of the Cayos de Sel, of which the lowest furnish springs of fresh water *, we again find the coast, from

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* Cayos del Agua (lat. 23° 58′, long. 82° 36′), on the

Punta de Icacos to Cabañas, free from danger. It affords in the interval, the anchorage of Matanzas, Puerto Escondido, the Havannah, and Mariel. Further on, westward of Bahia Honda, of which the possession might tempt a maritime enemy of Spain, the chain of shoals recommences (*bajos de Santa Isabel y de los Colorados*) extending without interruption as far as cape Saint Antonio. From that cape to Punta de Piedras and Bahia de Cortez, the coast is almost precipitous, and does not afford soundings at any distance; but between Punta de Piedras and Cabo Cruz, almost the whole southern part of Cuba is surrounded with shoals of which the isle of Pinos is but a portion not covered with water, and which are known on the west by the name of *Jardins* (*Jardines y Jardinillos*); and on the east, by that of *Cayo Breton*, *Cayos de las doce leguas*, and *Bancos de Buena Esperanza*. In all this southern circle the coast is exempt from danger only from the strait of Cochinos to the mouth of the Rio Guaurabo. These seas are of very difficult naviga-

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Placer de los Roques, or del Cayo de Sal. I place Cayo del Agua a little more to the west than Captain Steetz, in the excellent maps that accompany *l'Instruction nautique sur les Passages à l'île de Cuba*, 1825, p. 55, where the Morro of the Havannah is placed 84° 39′, and the Pan de Matanzas 15° 58′; while M. Ferrer, by means that merit the utmost confidence, finds them at 84° 42′ 44″ and 84° 3′ 12″.

tion: I had occasion to determine the position of several points in latitude and longitude during the passage from Batabano to Trinidad of Cuba and to Carthagena. It would seem that the resistance of the currents of the high-lands of the isle of Pines, and the remarkable stretching of cape Cruz, have at the same time favored the accumulation of sand, and the labor of the saxigen corals which prosper in calm and shallow water. In this development of the southern coast 145 leagues in length, there is only one-seventh of which the access is entirely free between Cayo de Piedras and Cayo Blanco, a little to the east of Puerto Casilda, where anchorages are found that are often frequented by small barks; such as the Surgidero del Batabano, Bahia de Xagua, and Puerto Casilda, or Trinidad of Cuba. Beyond this latter port, towards the mouth of the Rio Cauto and Cabo Cruz (behind the *Cayos de doce leguas*), the coast, filled with lagons, is little accessible, and almost entirely desert.

I have here annexed the most correct statements of the position of the ports of the island of Cuba:—

On the east of Cabo Cruz (lat. 19° 47′ 16″; long. 80° 4′ 15″): Santiago de Cuba (lat. 19° 57′ 29″, long. 78° 18′); Bahia de Guantanamo (lat. 19° 54′, long. 77° 36′); Puerto Escondido (lat. 19° 54′ 55″, long. 77° 24′); Baitiqueri (lat.

20° 2′, long. 77° 12′). North-west of cape Maysi (lat. 20° 16′ 40″, long. 76° 30′ 25″): Puerto de Mata (lat. 20° 17′ 10″, long. 76° 43′); Baracoa (lat. 20° 20′ 50″, long. 76° 50′); Maravi (lat. 20° 24′ 11″, long. 77° 17′); Puerto de Navas (lat. 20° 29′ 44″, long. 77° 20′); Cayaguaneque (lat. 20° 30′, long. 76° 56′); Taco (lat. 20° 31′ 17″, long. 77° 0′); Jaragua (lat. 20° 32′ 44″, long. 77° 3′); Puerto de Cayo Moa (lat. 20° 42′ 18″, long. 77° 14′); Yaguaneque (lat. 20° 42′, long. 77° 22′); Cananova (lat. 20° 41′ 30″, long. 77° 24′); Cebollas (lat. 20° 41′ 52″, long. 77° 28′); Tanamo (lat. 20° 42′ 41″, long. 77° 37′); Puertos de Cabonica y Livisa (lat. 20° 42′ 11″, long. 77° 46′); Nipe (lat. 20° 44′ 40″, long. 77° 51′); Banes (lat. 20° 52′ 50″, long. 78° 1′). North-west of Punta de Mulas (lat. 21° 5′, long. 77° 57′): Sama (lat. 21° 5′ 50″, long. 78° 11′). In the old Channel of Bahama: Naranjo (lat. 21° 5′ 23″, long. 78° 19′); Vita (lat. 21° 6′, long. 78° 25′); Bariai (lat. 21° 4′ 9″, long. 78° 27′); Jururu (lat. 21° 3′ 39″, long. 78° 28′); Gibara (lat. 21° 6′ 12″, long. 78° 33′); Puerto del Padre (lat. 21° 15′ 40″, long. 78° 49′); Puerto del Malagueta (lat. 21° 16′, long. 78° 58′); Puerto del Manati (lat. 21° 23′ 44″, long. 79° 7′); Puerto de Nuevas Grandes (lat. 21° 26′ 50″, long. 79° 13′); Puerto de las Nuevitas del Principe (lat. 21° 38′ 40″, long. 79° 20′); Guanaja (lat. 21° 42′, long. 80° 11′; Embarcadero del Principe (lat. 21° 44′, long. 80° 23′), between Rio Jiguey and Punta Curiana on the N.N.E. of Hato de Guanamacar; Moron (lat. 22° 4′, long. 80° 56′); Puerto de Remedios (lat. 22° 32′, long. 81° 56′); Puerto de Sierra Morena (lat. 23° 3′, long. 82° 54′). West and south-west of Punta Icacos (lat. 23° 10′, long. 83° 32′): Matanzas (lat. 23° 3′, long. 83° 54′); Puerto Escondido (lat. 23° 8′, long. 84° 12′); mouth of Rio Santa Cruz (lat. 23° 7′, long. 84° 18′); Jaruco (lat. 23° 9′, long. 84° 25′); Havannah (lat. 23° 9′, long. 84° 43′); Mariel (lat. 23° 5′ 58″, long. 85° 2′); Puerto de Cavañas (lat. 23° 3′, long. 85. 13′); Bahia Honda (the most southern coast of the bay near Potrero de Madrazo, lat. 20° 56′ 7″, long. 85° 32′ 10″). East of Cabo San Antonio (lat. 21° 50′, long. 87° 17′ 22″): Surgidero del Batabano (lat. 22° 43′ 19″, long. 84° 45′ 56″): Bahia de Xagua (lat. 22° 4′, long. 82° 54′). the two ports of the town of Trinidad de Cuba namely, Puerto Casilda (lat. 21° 45′ 26″, long. 82° 21′ 7″), the mouth of Rio Guaurabo (lat. 21° 45′ 46″, and long. 82° 23′ 37″). We find many *lagons* (Vertientes, Santa Maria, Curajaya, Yaguabo, Junco, &c.); but no ports properly so called, from Trinidad to Cabo Cruz.

The positions of 50 ports and anchorages o Cuba are the result of a labor from which (i 1826) I corrected the map of the island, published in 1820. The latitudes are, for the mos part, those of *Portulano de la America septentr. constr. en el Dep. hidrografico de Madrid*, 1818; but the longitudes differ considerably. *Portulano* places the Morro of the Havannah at 84° 37′ 45″, or 5′ too much to the east. (Consult *Bauza, Derotero de las Islas Antillas* 1820, p. 487, and *Purdy Colomb., Nav.* p. 175.) I have preferred the positions which M. Ferrer assigns to cape Cruz and cape Maysi, and to Punta de Mulas, and at those capes I reduced several points determined by Don Jose del Rio and Don Ventura Barcaiztegui, founded on my own observations, and differing altogether from those able mariners in the position they assign to Puerto Casilda. M. Bauza, who adopts the positions of Batabano and Punta Matahambre in my map, prefers placing Punta Maysi in long. 76° 26′ 28″, because he places Porto Rico, with Don Jose Sanchez Cerquero, at 68° 28′ 29″. The assemblage of observations sufficiently heterogeneous gives M. Cerquero 68° 26′ 30″, while M. de Zach regards 68° 31′ 0 as the most probable result. (*Corresp. astr.*, vol. 13, p. 125, 128.) M. Oltmanns had found after a discussion of all these elements, the mean to be 68° 32′ 30″. (*See* my *Rec. d'Observ. astron.*, Tom. ii, p. 139.)

At the island of Cuba, as heretofore in all the possessions of Spain in America, we must distinguish between the *ecclesiastic*, *politico-military*, and *financial* divisions. We will not add those of the *judicial* hierarchy, which have created so much confusion amongst modern geographers*, the island having but one *Audiencia* residing since the year 1797 at Puerto Principe, whose jurisdiction extends from Baracoa to Cape Saint Antonio. The division into two bishopricks dates from 1788, in which Pope Pius the 6th named the first bishop of the Havannah. The island of Cuba depended formerly, with Louisiana and Florida, on the archbishop of Santo Domingo, and from the period of its discovery, one bishoprick only had been founded in 1518, in the most western part, at Baracoa, by Pope Leo 10th. The translation of this bishoprick to Santiago de Cuba, took place four years later; but the first bishop, Fray Juan de Ubite, arrived only in 1528. In the beginning of the nineteenth century (1804), Santiago de Cuba was erected into an archbishoprick. The ecclesiastical limit between the diocese of the Havannah and Cuba passes in the meridian of Cayo Romano, nearly in the 80¼° of longitude west of Paris, between the *Villa de Santi Espiritus* and the *Ciudad* of *Puerto Principe*. The island, with relation to its political and military government, is divided in two *gobiernos*, depending on the same captain-general. The

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* *See* above, vol. iii, p. 443.

gobierno of the Havannah comprehends, besides the capital, the district of the *Quatre Villas* (Trinidad, now *Ciudad;* Santo Espiritu, Villa Clara, and San Juan de los Remedios), and the district of Puerto Principe. The Capitan general y Gobernador of the Havannah, names a lieutenant in the latter place *(Teniente Gobernador)*, as at Trinidad and Nueva Filipina. The territorial jurisdiction of the captain general extends as the jurisdiction of *corregidor*, to eight *pueblos de Aguntaimento* (the ciudades of Matanzas, Jaruco, San Felipe y Santiago, Santa Maria del Rosario; the *villas* of Guanabacoa, Santiago de las Vegas, Guines, and San Antonio de los Baños). The *gobierno of Cuba* comprehends Santiago de Cuba, Baracoa, Holguin, and Bayamo. The present limits of the *gobiernos* are not the same as those of the bishopricks. The district of Puerto Principe, with its seven parishes, for instance, depended till 1814, at the same time on the *gobierno* of the Havannah and the archbishoprick of Cuba *. In the enumerations of 1817 and 1820, we find Puerto Principe joined with Baracoa and Bayamo, under the *jurisdiction of Cuba*. It remains to speak of a third division altogether financial. By the *cedule* of the 23d March, 1822, the island was divided in three *Intendencias* or *Provincias*; that of the Havannah, Puerto Principe, and Santiago de Cuba, of which the respective length from east to west is nearly 90, 70, and 65 marine leagues. The intendant of the Havannah preserves the prerogatives of *Superintendente general subdelegado de Real Hacienda de la Isla de Cuba.* According to this division, the *Provincia de Cuba* comprehends Santiago de Cuba, Baracoa, Holguin, Bayamo, Gibara, Manzanillo, Jiguani, Cobre, and Tiguaros; the Provincia de Puerto Principe, the town of that name, Nuevitas, Jagua, Santo Espiritu, San Juan de los Remedios, Villa de Santa Clara, and Trinidad. The most westerly intendance, or *Provincia de la Havannah,* occupies all that is situated west of the *Quatro Villas*, of which the intendant of the capital has lost the financial administration. When the cultivation of the lands shall be more uniformly advanced, the division of the island into five departments, *de la vuelta de abaxo* (from Cape Saint Antonio to the fine village of Guanajay and Mariel), the Havannah (from Mariel to Alvarez), the *Quintas Villas* (from Alvarez to Moron), *Puerto Principe* (from Moron to Rio Cauto), and *Cuba* (from Rio Cauto to Punta Maysi), will perhaps appear the most fit, and most connected with the historical remembrances of the first times of the *conquest*.

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* *Documentos sobre el trafico de los Negros*, 1814, p. 127. 130.

My map of the island of Cuba, however imperfect it may be for the interior, is yet the only one on which the 13 *ciudades* and 7 *villas* are found which form the object of the divisions I have just enumerated. The limit between the two bishopricks (*linea divisoria de los dos obispados de la Havana y de Santiago de Cuba*) stretches from the mouth of the small river of Santa Maria (long. 80° 49′), on the southern coast by the parish of San Eugenio de la Palma, and by the *haciendas* of S. Ana, dos Hermanos, Copey and Cienega, towards la Punta de Iudas (long. 80° 46′), on the northern coast, opposite Cayo Romano. During the government of the Cortes of Spain, it was agreed that this ecclesiastical limit should be also that of the two *Deputaciones provinciales* of the Havannah and of Santiago. (*Guia Constitucional de la isla de Cuba*, 1822, p. 79). The diocese of the Havannah comprehends 40, and that of Cuba 22 parishes. Established at a time when the greater part of the island was occupied by farms of cattle (*haciendas de ganado*), these *paroquias* are of too great an extent, and little adapted to the wants of present civilization. The bishoprick of Santiago de Cuba contains the 5 *ciudades* of Baracoa, Cuba, Holguin, Guiza, Puerto Principe, and the Villa of Bayamo. In the bishoprick of San Cristobal of the Havannah are reckoned the 8 *ciudades* of the

Havannah, Santa Maria del Rosario, San Antonio Abad or de los Baños, San Felipe y Santiago del Bejucal, Matanzas, Jaruco, La Paz, and Trinidad, and the six villas of Guanabacoa, Santiago de las Vegas or Compostela, Santa Clara, San Juan de los Remedios, Santo Espiritu, and S. Julian de los Guines. The territorial division the most used, and the most popular among the inhabitants of the Havannah, is that of *vuelta de arriba* and *de abaxo*, east and west of the meridian of the Havannah. The first governor of the island who took the title of Captain-general (1601), was Don Pedro Valdes. Before him 16 other governors are reckoned, of whom the series begins with the famous *Poblador* and *Conquistador*, Diego Valasquez, native of Cuellar, whom Columbus had named in 1511.

Population.—We have just examined the extent, the climate, and the geologic constitution of a country which opens a vast field to human civilization. In order to appreciate the weight which, under the influence of such a position, the richest of the West India islands may one day put in the political balance of insulary America, we shall compare the actual population which a space of 3600 square leagues, for the most part virgin soil, and fertilised by tropical rains, might nourish. Three successive enumerations, of very unequal exactness, yielded in

1775 a population of	170,862
1791	272,140
1817	630,980

According to the last declaration of which we shall state the details, there were 290,021 whites; 115,691 free copper-coloured men, and 225,268 slaves. These results are conformable to the excellent statement which the municipality of the Havannah had submitted, in 1811, to the Cortes of Spain, and in which it fixed approximatively 600,000, of which 274,000 whites, 114,000 free men, and 212,000 slaves. In reflecting on the divers omissions of the last enumeration in 1817, on the introduction of slaves (the custom-house at the Havannah registered, in only three years, 1818, 1819, and 1820, more than 41,000); and on the increase of free men of colour and whites, by the comparison of the enumeration of 1810 and 1817, in the eastern part of the island, we find, that the island of Cuba, at the end of 1825, probably contained:

Free		455,000
whites	325,000	
free copper-coloured	130,000	
Slaves		260,000
Total		715,000

The population of the island of Cuba is consequently now very little different from that of all the English islands, and is almost double that of Jamaica. The relation of the divers classes of inhabitants grouped according to their origin, and the state of their civil liberty, furnishes the most striking contrasts in countries where slavery has taken such deep root. The table indicating these relations may give rise to the most serious reflections.

THE WEST INDIA ISLANDS compared with one another, and with the States of the CONTINENT.	Total population.	Whites.	Free men of Colour, Mulattoes and Blacks.	Slaves.	Distribution of Classes.
Island of Cuba	715,000	325,000	130,000	260,000	Whites .. 0,46 Free coloured 0,18 Slaves 0,36 1,00
Jamaica	402,000	25,000	35,000	342,000	Whites 0,06 Free coloured 0,09 Slaves 0,85 1,00
The whole of the English Islands	776,500	71,850	78,350	626,800	Whites 0,09 Free coloured 0,10 Slaves 0,81 1,00

The West India Islands, compared with one another, and with the States of the CONTINENT (*continued*).	Total population.	Whites.	Free men of Colour, Mulattoes and Blacks.	Slaves.	Distribution of Classes.
The whole Archipelago of the West Indies	2,843,000	482,600	1,212,900	1,147,500	Whites .... 0,17 Free coloured .... 0,43 Slaves 0,40 1,00
United States of North America	10,525,000	8,575,000	285,000	1,665,000	Whites .... 0,81 Free coloured .... 0,03 Slaves 0,16 1,00
Brazil	4,000,000	920,000	1,020,000	2,060,000	Whites .. .. 0,23 Free coloured .... 0,26 Slaves 0,51 1,00

We see by this table *, that in the island of Cuba free men compose $\frac{64}{100}$ of the whole population †; and in the English islands, scarcely $\frac{19}{100}$. In the whole archipelago of the West Indies, the copper-coloured men (blacks and mulattoes, free and slaves) form a mass of 2,360,000, or $\frac{83}{100}$ of the total population. If the legislation of the West Indies and the state of the men of colour does not shortly undergo a salutary change; if the legislation continues to discuss instead of acting, the political preponderance will pass into the hands of those who have strength to labour, the will to be free, and the courage to endure long privations. This sanguinary catastrophe will take place as a necessary consequence of circumstances, without the intervention of the free blacks of Hayti, and without their abandoning the system of insulation which they have hitherto followed. Who would venture to predict the influence which may be exerted by "An *African Con-*

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* This table relates to the end of the year 1823; the population of Cuba only, is of the year 1825. If we admit 936,000 for Hayti (vol. vi, p. 832), instead of 820,000, we shall have for the whole archipelago of the West Indies 2,959,000, of which 1,329,000, or $\frac{45}{100}$ instead of $\frac{43}{100}$ are free men of colour.

† The free men formed in 1788, in the French port of Saint Domingo 0,13 (namely, the whites, 0,08; free men of colour, 0,05), and slaves, 0,87.

federation of the free states of the West Indies, placed between Columbia, North America, and Guatimala, on the politics of the New World?" The fear of this event may act more powerfully on the minds of many, than the principles of humanity and justice; but in every island, the whites believe that their power is not to be shaken. All simultaneous action on the part of the blacks appears to them impossible; and every change, every concession granted to the captive population, a sign of weakness. Nothing presses: the horrible catastrophe of Saint Domingo was only the effect of the inability of the governors. Such are the illusions that prevail amidst the great mass of the planters of the West Indies, and which are alike opposed to an amelioration of the state of the blacks in Georgia and in the Carolinas. The island of Cuba, more than any other of the West India islands, might escape this common shipwreck. That island reckons 435,000 free men and 160,000 slaves: by prudent and humane measures, she might procure the gradual abolition of slavery. Let us not forget, that since Hayti is become free, there are in the whole archipelago of the West Indies, more free negroes and mulattoes than slaves. The whites, and above all, the free men, whose cause it would be easy to link with that of the whites, take a very rapid numerical increase at Cuba. The slaves would have diminished, since 1820, with great rapidity, but for the fraudulent continuation of the slave-trade. If, from the progress of human civilization, and the firm will of the new states of free America, this infamous commerce should cease altogether, the diminution of the captive population would become more considerable for some time, on account of the disproportion existing between the two sexes, and the emancipation which continues; and would only cease when the relation between the deaths and births of slaves were such that even the effects of setting free would be compensated. The whites and free men now form two-thirds of the whole population of the island, and this increase partly conceals the diminution of the slaves. Among the latter, the women are to the men, excluding the mulatto slaves, scarcely in the relation of 1 : 4, in the plantations of sugar-cane; in the whole island, as 1 : 1,7; and in the towns and farms where the negro slaves serve as domestics, or work by the day, at the same time on their own account and that of their master, as 1 : 1,4; even (for instance at the Havannah *), as 1 : 1,2. The

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* It appears to me probable that at the end of 1825, there existed, of the total population of men of colour (mulattoes and negroes, free and slaves), nearly 160,000 in the towns, and 230,000 in the fields. In 1811, the *Consulado,* in a

developments that follow, will shew that these relations are founded on numerical statements, which may be regarded as the *limit numbers of the maximum.*

The prognostics which are indulged on the diminution of the total population of the island, at the period when the slave-trade shall be really abolished, and not merely according to the laws, as since 1820; on the impossibility of continuing the cultivation of sugar on a large scale, on the approaching time when the agricultural industry of Cuba shall be restrained to plantations of coffee and tobacco, and the breeding of cattle, are founded on arguments of which the justness is far from appearing to me sufficiently proved. It is forgotten, that the sugar settlements, in several of which hands are wanted, and which weaken the negroes by frequent *night labours*, contain but one-fifth of the totality of slaves, and that the problem of the *quotient* of the total increase of population in the island of Cuba, at the period when the introduction of the African blacks shall entirely cease, rests on the most complicated elements;

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statement presented to the Cortes of Spain, supposed 141,000 men of colour in the towns, and 185,000 in the fields. *Documentos sobre los Negros*, p. 121. This great accumulation of mulattoes, free negroes, and slaves, in the towns, is a characteristic feature of the island of Cuba.

on *compensations* so varied in their effects among the whites, the free men, and the slaves who are cultivators; in the plantations of sugar-cane, coffee, or tobacco, among the slaves attached to farms of cattle, and the domestic slaves, artisans, or workmen in towns; instead therefore of hastening those gloomy presages, the planters would do well to wait till the government has procured positive statistical statements. The spirit in which even the most ancient enumerations were made, for instance that of 1775, by the distinction of age, sex, race, and state of civil liberty, merits the greatest praise. Nothing but the means of execution were wanting; it was felt that the repose of the inhabitants was powerfully interested in knowing partially, the occupations of the blacks, and their numerical distribution in the sugar settlements, farms, and towns. To remedy evil, to avoid public danger, to console the misfortunes of a race who suffer, and who are feared more than is acknowledged, the wound must be probed; for in the social body there is found, when directed by intelligence, as in organic bodies, a repairing force, which may be opposed to the most inveterate evils.

For the year 1811 (when the municipality and the Tribunal of Commerce of the Havannah supposed the total population of the island of Cuba to be 600,000, and that of 326,000 men of colour, free or slaves, mulattoes or blacks), the distribution of this mass in different parts of the island, in the towns and the country, yielded the following result, not stopping at absolute quantities, but only at the relations of every partial number with the total number of the men of colour considered as a unity.

TERRITORIAL DIVISIONS OF THE ISLAND OF CUBA.	Free coloured men.	Slaves.	Men of colour, free and slaves.
I. Western part (Juris- of the Havannah.			
In the towns...	0,11	0,11½	0,22½
In the fields....	0,01½	0,34	0,35½
II. Eastern part (Quatro Villas, Puerto Principe, Cuba).			
In the towns...	0,11	0,09½	0,20½
In the fields....	0,11	0,10½	0,21½
Total........	0,34½	0,65½	1,00

It results from this table, susceptible of being much improved by ulterior researches, that in 1811, nearly three-fifths of the men of colour resided in the jurisdiction of the Havannah, from Cape Saint Antonio to Alvarez; that in this part, the towns contained as many mulattoes and free negroes as slaves, but that the *coloured population* of the towns was to that of the fields as 2 : 3. In the eastern part of the island, on the contrary, from Alvarez to Santiago de Cuba and Cape Maysi, the men of colour inhabiting the towns, nearly equalled in number those spread over the farms. We shall soon see that from 1811 till the end of 1825, the island of Cuba has received on the whole extent of its coast, by lawful, and illicit means, 185,000 African blacks, of which the customhouse of the Havannah only, registered, from 1811 to 1820, nearly 116,000. This mass newly introduced, has no doubt been spread more in the country than in the towns; it must have changed the relations which men best informed of the localities, had established in 1811, between the eastern and western part of the island, between the towns and the fields. The negro slaves have much augmented in the eastern plantations; but the horrible certainty that, notwithstanding the importation of 185,000 *bozale negroes,* the mass of men of colour, free and slaves, has not augmented from 1811 to 1825, more than 64,000, or one-fifth, shews that the changes in the *relation of partial distribution,* are restrained within narrower limits than we were at first inclined to admit.

We have seen above, that in supposing 715,000 inhabitants (which I believe to be the *limit number of the minimum,*) the relative population of the island of Cuba is, at the end of the year 1825, 197 individuals by square marine league, consequently little more than half the population of Saint Domingo, and about one-fourth of that of Jamaica. If Cuba had been as well cultivated as the latter island, or rather, if the *density* of the population were the same, Cuba would have 3615 × 874 or 3,159,000 inhabitants*, that is, more than we now reckon in the whole republic of Columbia, or in the whole Archipelago of the West Indies. Yet Jamaica has still 1,914,000 acres not cultivated.

The most ancient official enumerations *(padrones y censas)* of which I obtained any knowledge during my stay at the Havannah, were made by the Marquess of la Torre (in 1774 and 1775), and Don Luis de Las Casas † (in 1791). It is known that in both an extreme negligence prevailed, and that a great part of the population found means to avoid being numbered. The *Padron* of 1775, which was known to the Abbe Raynal, gave for result:

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* In supposing the population of Hayti to be 820,000, we find 334 inhabitants for each square marine league. Supposing 936,000, the relative population is 382. National authors think that the island of Cuba can nourish seven millions and a half of inhabitants. (*See Récl. de los repr. de Cuba contra la ley de aranceles*, 1821, p. 9.) Even in this hypothesis the relative population would not equal that of Ireland. Some English geographers give Jamaica 4,090,000 acres, or 584 square marine leagues.

MEN	Whites	54,555
	Free Mulattoes	10,021
	Free Blacks	5,959
	Mulatto Slaves	5,518
	Black Slaves	25,256
		99,309

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† This governor founded the *Patriotic Society*, the *Junta de agricultura y comercio*, a public library, the *Consulado*, the house for poor girls (*Casa de beneficiencia de ninas indigentes*), the botanic garden, a chair of mathematics, and gratuitous primary schools (*escuelas de primeras letras*). He endeavoured to soften the barbarous forms of criminal justice, and created the noble function of *defensor de pobres*. The embellishment of the Havannah, the opening of the road of Guines, the construction of ports and dykes, and what is far more important, the protection granted to periodical writings fitted to vivify public spirit, date at the same period. Don Luis de las Casas y Aragorri, Captain-general of the island of Cuba (1790-1796), was born in the aldea of Sopuerta, in Biscay. He fought with great distinction in Portugal, at Pensacola, in the Crimea, before Algiers, at Mahon, and at Gibraltar. He died aged 55 years, at Puerto Santa Maria, in July, 1800. *See* the account of his life by Fray Juan Gonsales, (del Orden de Predicadores) and Don Tomas Romay.

Women	Whites	40,864
	Free Mulatresses	9,006
	Free Negresses	5,629
	Mulatress Slaves	2,206
	Negress Slaves	13,356
		71,061

Total, 170,370, of whom the sole jurisdiction of the Havannah contained 75,617. I had no opportunity of verifying the numbers by the official papers. The Padron of 1791 gives, conformably to the numbers on the registers, 272,141 inhabitants, of whom 137,800 were in the jurisdiction of the Havannah, namely: 44,337 in the capital, 27,715, in the other *ciudadas* and *villas* of the jurisdiction, and 65,748 in the country (*partidos del campo*). The most simple reflections seem to prove what is contradictory in the results of this statement *. The mass of 137,800 inhabitants of the jurisdiction of the Havannah appears here to be composed of 73,000 whites, 27,600 free men of colour, and 37,200 slaves; the whites would therefore be in relation to the slaves as 1 : 0,5, instead of the relation of 1 : 0,83, which has been long observed in the town and in the fields. In 1804, I discussed, with persons who possessed great knowledge of the localities, the enumeration of Don Luis de las Casas. In seeking by partial comparisons, the value of the quantities omitted, it appeared to us that the population of the island in 1791, could not be below 362,700. That population has been augmented from 1791 to 1804 by a number of negroes *(bozales)*, which amounted during that period, according to the custom-house registers, to 60,393; the emigrations from Europe to Saint Domingo (5000); and finally, the excess of births over deaths, so very small in a country where one-fourth or one-fifth of the whole population is condemned to a state of celibacy. The effect of these three causes of augmentation, reckoning only an annual loss of seven per cent on the *bozale negroes*, was estimated at 60,000; whence resulted approximatively for 1804, a *minimum* * of 432,080. The enumeration of 1817 yields a population of 572,363, and should also be only considered as a limit-number at the *minimum*; it justifies the result on which I fixed in 1804, and which has since been inserted in several statistical works. The registers of the customs state, that from 1804 to 1816, more than 78,500 negroes have been landed.

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* *Andreas Cavo de vita Jos. Jul. Pareñi Havanensis* (*Romæ*, 1792), p. 10. Some copies bear 151,150 instead of 137,800.

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* In the number of 432,000, I computed for 1804: whites, 234,000; free men of colour, 90,000; slaves, 108,000. (The enumeration of 1817, yielded 290,000 whites, 115,000 free men of colour, and 225,000 slaves.) I had estimated the black slave population, counting a production of 80 to 100 arrobas of sugar per head in the sugar manufactories, and 82 slaves for the mean population of an *yngenio*. There were at that time more than 350 sugar manufactories; and, in the seven parishes of Guanajay, Managua, Batabano, Guines, Cano, Bejucal, and Guanabacoa, an exact enumeration had yielded 183 *yngenios*, 15,130 slaves. (*Expediente*, p. 134. *Represent. del Consulado de la Habana*

del 10 *Julio*, 1799, manuscript.) The relative proportion between the production of sugar and the number of negroes employed in the fabrication, it is very difficult to ascertain: there are establishments where 300 negroes scarcely produce 30,000 arrobas of sugar; in others, 150 negroes fabricate yearly 27,000 arrobas. The number of whites may be determined by that of the *milicias*, of which there were in 1804, *disciplinadas*, 2680; *rurales*, 21,831, notwithstanding the extreme facility of avoiding the service, and the exceptions granted without number to *Abogados, Escribanos, Medicos, Boticarios, Notarios, Sacristanes y Servientes de Iglesia, Ministros de Escuela, Mayorales, Mercadores*, and whoever called themselves *noble*. Compare *Reflexiones de un Habanero sobre la independencia de esta isla*, 1823, p. 17. In 1817, the men computed capable of bearing arms, from 15 to 60, were: 1st. in the free class, 17,047 whites; 17,862 free mulattoes; 17,246 free negroes (total of free-men, 106,155); 2d. in the class of slaves, 10,506 mulattoes, and 75,393 blacks (total of slaves 85,899; total of free and slaves, between 15 and 60 years, 192,054). In taking for the basis the relations of the military levies, and the population in France (*Peuchet Stat.*, p. 243, 247), we find that the estimate of 192,054 would suppose a population of less than 600,000. The *contingents* of the three classes of whites, freed-men and slaves, are as the numbers 0,37; 0,18; 0,45; while the population of those classes is probably as 0,46; 0,18; 0,36.

The most important documents which we hitherto possess on the population of the island, were published on occasion of a celebrated proposition made in the assembly of the Cortes, 26th March, 1811, by MM. Alcocer and Arguelles, against the slave-trade in general, and against the perpetuity of slavery among the blacks born in the colonies. These precious documents accompany, as justificatory pieces, the representations * which Don Francisco de Arango, one of the most enlightened and best-informed statesmen of his country, and of its position, made to the Cortes, in the name of the Municipality, the *Consulado* and the Patriotic Society of the Havannah. He reminded them that "there exists no other general verification than that which was attempted in 1791, under the able administration of Don Luis de las Casas, and that since that period there had been only partial enumerations in some of the most peopled districts." The results published in 1811, are therefore only founded on the incomplete statements and the approximative estimates of the augmentation in 1791 to 1811. In the following table we have adopted the division of the island into four districts, namely: 1st. The *Jurisdiction of the Havannah*, or *Western Part*, between Cape Saint Antonio and Alvarez; 2d. The *Jurisdiction des Quatro Villas*, with its eight parishes, situated on the east of Alvarez; 3d. The *Jurisdiction de Puerto Principe*, with seven parishes; 4th. The *Jurisdiction of Santiago de Cuba*, with fifteen parishes. The three latter districts comprehend the eastern part of the island.

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* *Representacion del* 16 *de Agosto* 1811, *que por encargo del Ayuntamiento, Consulado y Sociedad patriotica de la Habana, hizo el Alferez mayor de aquella ciudad, y se elevó a las Cortes por los espresados cuerpos.* This piece is printed among the *Documentos sobre el trafico y esclavitud de negros,* 1814, p. 1-86, which I had occasion to mention above. Some general results of the labours of M. Arango had been published, in 1812, in the *Patriota de la Habana,* tom. ii, p. 291.

POPULATION IN 1811.

TERRITORIAL DIVISIONS.	Whites.	Free men of colour.	Slaves.	Total.
I. EASTERN PART	113,000	72,000	65,000	250,000
Jur. of Cuba	40,000	38,000	32,000	110,000
Jur. of Puerto Principe	38,000	14,000	18,000	70,000
Jur. of Quatro Villas	35,000	20,000	15,000	70,000
II. WESTERN PART	161,000	42,000	147,000	350,000
Havannah and Suburbs	43,000	27,000	28,000	98,000
Fields	118,000	15,000	119,000	252,000
Island of Cuba	274,000	114,000	212,000	600,000

The relations of the castes with each other will remain a political problem of high importance till the period when a wise legislation shall have succeeded in calming inveterate animosities, and in granting a greater equality of rights to the oppressed classes. In 1811, the number of whites in the island of Cuba surpassed that of the slaves by 62,000, whilst it nearly equalled the number of the people of colour, both free and slaves. The *lancs*, who in the French and English islands formed at the same period nine-hundredths of the total population, composed at the island of Cuba forty-five-hundredths. The free men of colour amounted to nineteen hundredths, that is double what is found at Jamaica and Martinique. The enumeration of 1817, modified by the *Deputacion Provincial*, having only yielded 115,700 freedmen and 225,300 slaves, that comparison proves, 1st. that the freedmen have been estimated with little precision either in 1811 or in 1817; and, 2d. that the mortality of the negroes is so great, that notwithstanding the introduction of more than 67,700 African negroes *registered* at the custom house, there were only 13,300 more slaves in 1817 than in 1811.

The decrees of the Cortes (of 3d March and 26th July, 1813), and the necessity of knowing the population in order to assemble the *juntas electorales de provincia*, *de partido* and *paroquias*, engaged the administration in 1817 to substitute a new enumeration for the *approximative estimates* attempted in 1811. I shall give this statement from a manuscript note communicated to me officially by the American deputies to the Cortes. The results have hitherto been only printed by extracts, in the *Guias de Forasteros de la Isla de Cuba* (1822, p. 48, and 1825, p. 104), and in the *Reclamacion hecha contra la ley de Aranceles* (1821, p. 7.)

ENUMERATION of 1817 (excluding 58,617 Transeuntes and Negroes brought to the Island in that year).

GREAT TERRITORIAL DIVISIONS: (*Provincias y Gobiernos.*)	Partidos.	Paroquias.	Civil, Military, and Ecclesiastical State of the Whites.		Whites.	Free men of colour.	Slaves.	Total.
I. Province of the Havannah	12	94	....	....	197,658	58,506	136,213	392,377
a) Gobierno-politico of the *Havannah.*	10	69	Civil. Eccles. Milit.	123,566 644 10,967	135,177	40,419	112,122	
b) Gobierno of *Matanzäs.*	1	12	Civil. Eccles. Milit.	9,501 10 1,106	10,617	1,676	9,594	
c) Gobierno of *Trinidad* with the three Villas of Santo Espiritu, Remedios and Villa Clara.	1	15	Civil. Eccles. Milit.	50,332 80 1,452	51,864	16,411	14,497	
II. Province of Cuba	5	34	....	....	59,722	57,185	63,079	179,986
a) Gobierno-politico of *Cuba,* with the three Teniene. of Bayamo, Holguin, and Barracoa.	4	28	Civil. Eccles. Milit.	30,587 171 2,975	33,733	50,230	46,500	
b) Ten. Gobern. of *Puerto Principe.*	1	6	Civil. Eccles. Milit.	24,830 129 1,030	25,989	6,955	16,579	
Population of the island of Cuba, according to the census of 1817....	17	128	....	....	257,380	115,691	199,292	572,363

It may seem surprising that the approximative estimate, presented to the Cortes in 1811, furnishes a total of 28,000 more than that of the *effective* verification of 1817; but this is only an apparent contradiction. The last verification was no doubt less imperfect than that of 1791; yet it remained below the existing population, on account of the apprehension every where excited in the people by an operation which they regarded as the precursor of new taxes. The *Deputacion Provincial* also, in transmitting the enumeration of 1817 to Madrid, thought fit to make two modifications. 1st. by adding 32,641 whites (*transeuntes del comercio y de los buques entrados*) whom commercial affairs call to the island of Cuba, and who make a part of the equipage in the books of the captains of the ports; and 2dly. the 25,076 *bozale negroes,* who were imported in the year 1817 only; whence would result, for that year, according to the opinion of the *Deputacion Provincial,* a total of 630,980, of which 290,021 were whites, 115,691 free men of colour, and 225,261 slaves. It is, I suppose, by an error, that in the almanacks (*Guias*) published at the Havannah, and in several manuscript tables lately sent to me, this total of 630,980 is marked as belonging not to the end of 1817, but to the commencement of the year 1820. The *Guias,* for instance, add to 199,292 slaves of the *census* of 1817, 25,076 as "*aumento que se considera de* 1817 *à* 1819." Now, if the registers * of the custom-house prove, that the number of negroes landed in those three years was 62,947; namely, in 1817, 25,851; in 1818, 19,902; in 1819, 17,194. The judicious author of *Letters on the Havannah*, addressed to Mr. Croker, first secretary of the Admiralty, believes the population of the men of colour, free and slaves, to be 370,000, in 1820; but he regards * the total addition of 32,641 proposed by the *provisional Junta* to be too much. He supposes that the whole population was, in 1820, only 250,000; and he admits, as the result of the census of 1817, only 238,796 whites (of whom 129,656 were males, and 109,140 females). The real number published during several successive years in the *Guia*, is 257,380.

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* *Notes on Mexico*, p. 217. The verification of 1817, is carried in this work to 671,079 instead of 630,980. This difference arises from a fault in the numbers relating to the *free men of colour*. The table of M. Poinsett yields: free blacks, males 28,373; females 26,002: free mulattoes, males 70,512; females 29,170: total free of colour, 154,057. Now, the *censo* furnishes, according to the *Guias* and my manuscript table, but 115,699, a difference of 38,358. In substituting for the free men 32,154 for 70,512, we find a number that renders the relative proportion of the two sexes less shocking, and more in harmony with the relations observed among the free blacks. If there were 70,000 free mulattoes and 28,000 free blacks in the island of Cuba, how should we find, according to M. Poinsett himself, a number of individuals capable of bearing arms, nearly equal (17,862 and 17,246) of the free mulattoes and negroes? And how, at the Havannah, according to the verification of 1810 (vol. vii, p. 26), would there be only 9700 free mulattoes of both sexes, and 16,600 free negroes and negresses? The *Notes on Mexico*, the accuracy of which in general we cannot too much applaud, indicate for the whole island, in 1817, *a*), 32,302 mulatto slaves, and 166,843 negro slaves, in the relation of 1 : 5; *b*) 74,821 women slaves of all colours, and 124,324 men slaves, in the relation of 1 : 1,7. At the Havannah, however, where mulatto slaves are much more numerous than in the country, their relation to the black slaves is only 1 : 11; and in the jurisdiction of Filipinas (*Memorias de la Soc. economica de la Habana*, 1819, n° 31, p. 232), there was found, in 1819, on 3634 slaves, 1049 women (52 mulatresses, 437 creole negroes, and 560 *bozale* negresses, recently imported), and 2585 men (91 mulattoes, 548 creole negroes, and 1946 bozale negroes).

How can we wonder at the partial contradictions of the tables of population prepared in America, when we recollect the difficulties to be vanquished, at the centre of European civilization, in England and France, whenever the great operation of a general enumeration is undertaken? We *know*, for instance, that the population of Paris was 714,000, in 1820; and it is *believed*, that according to the number of deaths and the supposed relation of births with the total population, it was 530,000 at the beginning of the eighteenth century (*Rech. stat. sur la ville de Paris, par le comte de Chabrol*, 1823, p. 18); but we do not know within one-sixth the population at the period of the ministry of M. Necker. We know that in England and Wales, the population increased from 1801 to 1821, 3,104,683, and yet the registers of births and deaths shew an increase of only 2,173,416, and it is impossible to attribute 931,276 to the emigrations from Ireland to England. (*Statist. Illustrations on the British Empire*, 1825, p. 14 and 157.) These examples do not prove that we must distrust all calculations of political economy; they only prove that we should employ numerical elements after having well discussed them and determined the limits of the errors. We might almost compare the different degrees of probability which statistical results furnish in the Ottoman Empire, in Spanish or Portugueze America, in France or in Prussia, with those geographical positions which are founded either on lunar eclipses, on the distances of the moon from the sun, or on the occultations of the stars.

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* There are also several errors of figures in the *Letters from the Havannah*, pp. 16-18, and 36; the slaves, in 1817, are estimated at 124,324, instead of 199,292; for 1819, at 181,968, forming an excess of 143,050 above the white population. That population, however, was already above 290,000. I believe it was in 1825, at least 325,000, and a *Habanero*, one of the best informed on the localities, had even supposed it, in 1823, to be 340,000. *Sobre la Independ. de Cuba*, p. 17. The statistical tables have, in some parts of the island, been framed with great care; for instance, at San Juan de los Remedios and at Filipinas, for the year 1819, by Don Joaquin Vigil de Quiñiones, and Don Jose de Aguilar.

To reduce an enumeration made twenty years before to another stated period, we must know the *quotient* of the increase; now, that *quotient* is known only from the enumerations of 1791, 1810, and 1817, made in the eastern part of the island, which is the least populous. When the comparisons bear upon too small masses, placed under the influence of peculiar circumstances, (for instance, on the sea-ports, or on the cantons where the fabrics of sugar are much accumulated), they cannot yield numerical results fit to be employed for the whole extent of a country. It may be perceived that the number of whites increases more in the country than in towns; that the free men of colour who prefer agriculture to the exercise of a trade in the towns, augment with more rapidity than the other classes, and that the negro slaves, among whom there is not a third of women, diminish more than $\frac{8}{100}$ annually.

We have seen above, that at the Havannah and in the suburbs, the increase of the whites has been in 20 years, 73 per cent; that of free men of colour, 171 per cent. In the eastern part, the whites and free men were doubled almost every where during the same interval. We shall remark on this occasion, that the free men of colour augment partly by the passage of one caste to another, and that the augmentation of the slaves, by the activity of the slave-trade, contributes also powerfully. The whites now gain little by the emigrations from Europe *, the Canaries, the West India islands, and the continent; they augment of themselves, for the examples of an *official whitening*, or *white letters* granted by the *Audiencia* to families of a pale yellow, are not numerous.

In 1775, was found, by an official dismembering of the *jurisdiction of the Havannah*, comprehending under that denomination six *ciudades* (the capital with the suburbs, Trinidad, San Felipe y Santiago, S. Maria del Rosario, Jaruco, and Matanzas) and six *villas* (Guanabacoa, Santi Espiritus, Villa Clara, San Antonio, San Juan de los Remedios, and Santiago), and thirty-one *pueblos*: a population of 171,626; and in 1806, with more certainty, 277,364 (*Patriota amer.* tom. ii, p. 300). The increase during thirty-one years was consequently but 0,61; it would appear much more rapid, if we could compare the half of that interval. In fact, the Padron of 1817 gives, for the same extent of country, then called *Provincia de la*

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* In 1819, for instance, there arrived only 1702 individuals, amomg whom were: from Spain, 416; from France, 384; from Ireland and England, 201. Maladies carry off one-seventh to one-sixth of the whites who are not acclimated.

Habana, and containing the *Gobiernos* of the capital, of Matanzas, Trinidad, or the *Quatro Villas*, a population of 392,377; which proves an increase in eleven years, of more than 0,41. We must not forget, that in comparing the population of the capital and the province of Cuba in the years 1791 and 1810, we obtain results of increase a little too great, the first of these enumerations having led to many more omissions than the second. I believe we approach nearer the truth in comparing, for the province of Cuba, the more recent *censos* of 1810 and 1817. We there find: in 1810, whites, 35,513; free men of colour, 32,884; slaves, 38,834. Total, 107,231; and in 1817, whites, 33,733; free men of colour, 50,230; slaves, 46,500. Total, 130,463; an increase in six years of above 23,200, or 21 per cent, for there is probably an error in the second verification of the whites. The number of the latter, and the number of free men in general, is so considerable in the district of the *Quatro Villas*, that, in the six *partidos* of S. Juan de los Remedios, S. Augustin, S. Anastasio del Cupey, San Felipe, Santa Fe, and Sagua la Chica, there was found, in 1819, on an *area* of 24,651 *caballerias*, a total population of 13,722; of which, 9572 were whites; 2010 men of colour; and 2,140 slaves. In the same year, on the contrary, in the ten *partidos* of the jurisdiction of Filipinas, were found, on a total population of 13,026, nearly 9400 free men, namely: whites, 5871; free men of colour, 3521 (of whom 203 were free *bozale negroes*); slaves, 3634: the free men were therefore to the whites = 1 : 1,7.

In no part of the world where slavery prevails is emancipation so frequent as in the island of Cuba. The Spanish legislature, far from preventing this, or rendering it difficult, like the English and French legislatures, favors liberty. The right of every slave to *buscar amo* (change his master), or set himself free, if he can repay the price of the purchase, the religious feeling which inspires many masters in easy circumstances with the idea of giving liberty by their will, to a certain number of slaves, the habit of keeping a multitude of blacks for domestic services, the attachments which arise from this intercourse with the whites, the facility with which slaves make money who are mechanics, and who pay their masters a certain sum daily, in order to work on their own account; such are the principal causes from which so many slaves in the towns pass from the captive state, to that of free men of colour. I might add the chances of the lottery, and games of hazard, if too much confidence in those means had not often produced the most fatal effects. The condition of free men of colour is happier at the Havannah, than among nations which boast during ages of the most advanced civilization. Here those barbarous laws * are unknown, which have been appealed to in our days, and according to which, free men incapable of receiving the donations of whites, may be deprived of their liberty, and *sold for the profit of the fiscal,* if they are convicted of having afforded an asylum to maroon negroes!

The primitive population of the West India islands having entirely disappeared (the *Zambos* Caribs, mixture of natives and negroes, having been transported in 1796, from St. Vincent's island to that of Ratan), the actual population of the islands (2,850,000) must be considered as composed of European and African blood. The negroes of pure race form nearly two-thirds; the whites one-fifth; and the mixed race one-seventh. In the Spanish colonies of the continent, we find the descendants of the Indians who disappear among the *mestizos* and *zambos,* a mixture of Indians with whites and negroes. The archipelago of the West Indies presents no such consoling idea. The state of society was there such, at the beginning of the sixteenth century, that, with some rare exceptions, the new planters paid as little attention to the natives as the English now do in Canada. The Indians of Cuba have disappeared like the Guanches of the Canaries, although at Guanabacoa and Teneriffe false pretensions were renewed forty years ago, by several families, who obtained small pensions from the government on pretext of having in their veins some drops of Indian or Guanche blood. There no longer exist any means of judging of the population of Cuba or Hayti in the time of Columbus. How can we admit, with some otherwise judicious historians, that the island of Cuba, at its conquest in 1511, had a million of inhabitants *, and that there remained of that million, in 1517, only 14,000! All the statistic statements in the writings of the bishop of Chiapa are filled with contradictions; and if it be true that the good dominican monk, Fray Luys Bertran, who was persecuted † by the *encomenderos*, as the methodists in our times are by some English planters, predicted, on his return, that "the 200,000 Indians which Cuba contained, would perish the victims of the cruelty of the Europeans," we must at least conclude, that the native race was far from being extinct between the years 1555 and 1569 [*]; according to Gomara [†], however, (such is the confusion among the historians of those times,) there were no more Indians in the island of Cuba in 1553. In order to conceive how vague were the estimates made by the first Spanish travellers, at a period when the population of no province of the peninsula was known, we have but to recollect the number of inhabitants which Captain Cook and other navigators attributed to Taïti and the Sandwich islands [‡], at a time when statistics furnished the most exact comparisons, varied from one to five. We may conceive that the island of Cuba, surrounded with fishing coasts, might, from the great fertility of its soil, nourish several millions of Indians, sober, without taste for animal food, and cultivating maize, manioc, and other nourishing roots; but if this accumulation of population had taken place, would it not have manifested itself by a more advanced degree of civilization than the narrative of Columbus relates? Would the people of Cuba have remained below the civilization* of the inhabitants of the Lucayes islands? Whatever activity we may attribute to the causes of destruction, the tyranny of the *conquistadores*, the faults of governors, the too severe labors of the gold washings, the small-pox, and the frequency

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* Judgment of the Sovereign Council of Martinique, 4th June, 1810. Ordinance of March 1st, 1766, § 7.

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* *Albert Hüne, Historisch-philosophische Darstellung des Negersclavenhandels,* 1820, tom. i, p. 137.

† *See* the curious revelations in *Juan de Marieta, Hist. de todos los Santos de España, libro* vii, p. 174.

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[*] The only thing known with certainty of Fray Luys Bertran is the time of his return to San Lucar (in 1569). He was consecrated priest in 1547. *L. c.* p. 167 and 175. (Compare also *Patriota,* tom. ii, p. 51.)

[†] *Hist. de las Indias,* fol. xxvii.

[‡] On the rapid diminution of the population in the archipelago of the Sandwich islands, since Captain Cook's voyage, see *Gilbert Farquhar Mathison, Narrat. of a visit to Brazil, Peru, and the Sandw. Islands,* 1825, p. 489. We know with some certainty, from the reports of missionaries who have changed the face of things at Taïti, profiting from its interior dissensions, that the whole archipelago of the Society islands contained, in 1818, but 13,900 inhabitants, of whom 8000 pertained to Taïti. Can we believe in the 100,000 which were supposed to exist in Taïti only, in the time of Cook? The bishop of Chiapa was not more vague in the estimates of the native population of the West Indies, than modern writers on the population of the groupe of the Sandwich islands, to which they sometimes give 740,000. (*Hassel, Hist. stat. Almanach fur* 1824, p. 384), sometimes 400,000 (*Id., Stat. Umriss,* 1824, *Heft* 3, p. 90). This groupe, according to M. Freycinet, contains but 264,000.

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* *De menor policia,* Gomara, p. xxi. The disgust marked by the natives in general of equinoxial America, for animal food and milk, is expressed in the famous bull of Pope Alexander VI, in 1493. "Certas insulas remotissimas et etiam terras firmas invenerunt, in quibus quamplurimæ gentes, *pacifice viventes,* nudæ incedentes, *nec carnibus vescentes,* inhabitant et, ut nuntii vestri possunt opinari, gentes ipsæ *credunt unum Deum creatorem in cœlis esse.*" (*Car. Coquel. Bull. amp. Coll.,* tom. iii, p. iii, p. 234.) In those very islands where the people dreaded the influence of the *zemes,* small idols of cotton (*Petr. Martyr. Epist.,* fol. 46), monotheism (the belief of a *Great Spirit,* superior to the *zemes*) was universally spread!

of suicides*, it would be difficult to conceive how in thirty or forty years, I will not say a million, but three or four hundred thousand Indians could entirely disappear. The war with the Cacique Hatuey was short, and restrained to the most eastern part of the island. Few complaints arose against the administration of the two first Spanish governors, Diego Velasquez and Pedro de Barba. The oppression of the natives dates from the arrival of the cruel Hernando de Soto, towards 1539. Supposing, with Gomara, that fifteen years later, under the government of Diego de Majariegos (1554-1564), there were no longer any Indians, we must necessarily admit, that there were considerable remains of that people which saved themselves on canoes in Florida, believing, according to ancient traditions, that they were returning to the country of their ancestors. The mortality of the negro slaves, observed in our days in the West Indies, can alone throw some light on these numerous contradictions. To Columbus and Velasquez, the island of Cuba must have appeared well peopled *, if it was, for instance, to the degree in

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* The rage of hanging themselves by whole families, in huts and caverns, related by Garcilasso, was no doubt the effect of despair; yet instead of lamenting the barbarism of the sixteenth century, it was attempted to exculpate the *conquistadores*, by attributing the disappearance of the natives to *their taste for suicide. See Patriota*, tom. ii, p. 50. All the sophisms of this kind are found assembled in a work published by M. Nuix, *on the humanity of the Spaniards in the conquest of America.* (*Reflexiones imparciales sobre la humanidad de los Españoles contra los pretendidos filosofos y politicos, para illustrar las historias de Raynal y Robertson, escrito en Italiano por el Abate Don Juan Nuix, y traducido al castellano por Don Pedro Varela y Ulloa, del Consejo de S. M.*, 1782.) The author, who calls the expulsion of the Moors under Philip III, a meritorious and religious act (p. 186), terminates his work by congratulating the Indians of America (p. 293) " on having fallen into the hands of the Spaniards, whose conduct has been at all times the most humane, and the government the wisest." Several pages of this book recall "the salutary rigour of the dragonades;" and that odious passage, in which a man known for his talents and his private virtues, the Count de Maistre (*Soirées de Saint Petersbourg*, tom. ii, p. 121), justifies the inquisition of Portugal, " which has only caused some drops of guilty blood to flow." To what sophisms must they have recourse, who would defend religion, national honor, or the stability of governments, by exculpating all that is offensive to humanity in the actions of the clergy, the people, or kings! It is a vain attempt to seek to destroy the power most firmly established on the earth, the testimony of history.

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* Columbus relates that the island of Hayti was sometimes attacked by a race of *black men, gente negra,* who lived more to the south or south-west. He hoped to visit them in his third voyage, because those black men possessed a metal *guanin,* of which the admiral had procured some pieces in his second voyage. These pieces were sent to Spain, and found to be composed of 0,63 of gold, 0,14 of silver, and 0,19 of copper (*Herera, Dec. I, lib. 3, cap. 9, p. 79*). In fact, Balboa discovered this black tribe in the

which it was found by the English in 1762. The first travellers were easily deceived by the

isthmus of Darien. "That conquistador, says Gomara (*Hist. de Ind.*, fol. 34), entered the province of Quareca: he found no gold, but some blacks, slaves of the lord of the place. He asked this lord whence he had received them; who replied, that men of that colour lived near the place, with whom they were constantly at war." "These negroes, adds Gomara, exactly resembled those of Guinea, and no others have been seen in America *(en las Indias yo pienso que no se han visto negros despues)*." The passage is very remarkable. Hypotheses were formed in the sixteenth century, as they are now; and Petrus Martyr (*Ocean. Dec. III, lib.* 1, p. 43) imagined that these men, seen by Balboa, the Quarecas, were Ethiopian blacks who,(*latrocinii causa*) infested the seas, and had been shipwrecked on the coast of America. But the negroes of Soudan are not pirates; and it is easier to conceive that the Esquimaux, in their boats of skins, may have gone to Europe, than the Africans to Darien. The learned who believe in a mixture of the Polynesians with the Americans, rather consider the Quarecas as of the race of Papoux, similar to the *negritos* of the Philippines. These tropical migrations from west to east, from the most western part of Polynesia to the isthmus of Darien, present great difficulties, although the winds blow during whole weeks from the west. Above all, it is essential to know if the Quarecas were really like the negroes of Soudan, as Gomara asserts, or whether they were only a race of very dark Indians (with flat and glossy hair), who from time to time, before 1492, infested the coasts of this very island of Hayti, become in our days the domain of Ethiopians. On the passage of the Caribs, from the Lucayes isles to the Little Antilles, without touching at the Great, *see* above, vol. vi, p. 28.

crowds which the appearance of European vessels brought together on some points of the coast. Now, the island of Cuba, with the same *Ciudades* and *Villas* which it possesses at present, had not in 1762 more than 200,000 inhabitants; and yet, among a people treated like slaves, exposed to the madness and brutality of their masters, to excess of labor, want of nourishment, and the ravages of the small-pox,—forty-two years do not suffice to leave no remembrance of their misfortunes on the earth. In several of the Little Antilles, the population diminishes under English domination, five and six per cent annually*; at Cuba, more than eight per cent; but the annihilation of 200,000 in forty-two years, supposes an annual loss of twenty-six per cent, a loss scarcely credible, although we may suppose that the mortality of the natives of Cuba was much greater than that of negroes bought at a very high price.

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* The number of *registered slaves* at Dominico, in 1817, was 17,959; at Grenada, 28,024; at Saint Lucia, 15,893; at Trinidad, 25,941. These islands, in 1820, reckoned only 16,554; 25,677; 13,050, and 23,537 slaves respectively. The loss therefore, in *three years*, according to the registers, was one-twelfth, one-eleventh, one-fifth, and one-eleventh. (*Manuscript Documents*, communicated by the kindness of Mr. Wilmot, under-secretary of state in the Colonial department in Great Britain.) We have seen above, that before the abolition of the slave-trade, the slaves in Jamaica diminished 7000 annually.

In studying the history of the island, we observe that the movement of colonization has been from east to west; and that here, as every where in the Spanish colonies, the places first peopled are now the most desert. The first establishment of the whites was in 1511, when, according to the orders of Don Diego Columbus, the *conquistador* and *poblador* Velasquez, disembarked at Puerto de Palmas, near Cape Maysi, then called *Alfa y Omega*, and subdued the cacique Hatuey, who, an emigrant and fugitive from Hayti, had withdrawn to the eastern part of the island of Cuba, and had become the chief of a confederation of little native princes. The town of Baracoa was begun to be built in 1512; and later, the Puerto Principe, Trinidad, the Villa de Santi Espiritus, Santiago* de Cuba (1514), San Salvador de Bayamo, and San Cristobal de la Havana. This last town was at first founded in 1515, on the southern coast of the island, in the *Partido* of Guines, and transferred, four years later, to Puerto de Carenas, the position of which at the entrance of the two channels of Bahama (*el Viejo y el Nuevo*), appears to be much more favorable to commerce than the coast on the south-west of Batabano *. The progress of civilization since the sixteenth century, has had a powerful influence on the relations of the castes with each other; these relations vary in the districts which contain only farms for cattle, and in those where the soil has been long cleared; in the sea-ports and inland towns, in the spots where colonial produce is cultivated, and in such as produce maize, vegetables, and forage.

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* *Patriota*, tom. ii, p. 280. *Manuscrits de Don Felix de Arrate*, put in order in 1750, from the official pieces saved in the great fire of the Havannah, in 1538. I am surprised to see (*Guia*, 1815, p. 73) that the Franciscan monks of Santiago de Cuba carry back the foundation of their convent to the year 1505; the whole discovery of the coast by Sebastian de Ocampo dates only from the year 1508.

I. The *Jurisdiction of the Havannah* shews a diminution of the *relative population* of the whites in the capital and its vicinity, but not in the inland towns, and in the whole *vuelta de abaxo* destined for plantations of tobacco, where free hands are employed. The verification of Don Luis de las Casas, in 1791, gave, for the jurisdiction of the Havannah, 137,800 souls; among whom, the relations of the *whites*, the *free men of colour*, and the *slaves*, were respectively

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* *See* above, vol. vii, p. 59. *Documentos*, p. 116. A tree is still shewn at the Havannah, under the shade of which (at Puerto de Carenas), the Spaniards celebrated their first mass. The island, now called officially the *siempre fiel Isla de Cuba*, was after its discovery named successively *Juana, Fernandina, Isla de Santiago*, and *Isla del Ave Maria*. Its arms date from the year 1516.

0,53; 0,20; 0,27: in 1811, from the great importation of slaves, these relations were believed to be as 0,46; 0,12; 0,42. In the districts of the great plantations of sugar and coffee (*partidos de grande labranzas*), the whites scarcely form a third of the population, and the *relations of the castes* (taking that expression in the sense of the relation of each caste to the total population), oscillate for the whites between 0,30 and 0,36; for the free men of colour, between 0,03 and 0,06; for the slaves, between 0,58 and 0,67; while, in the districts of the cultivation of tobacco of the *vuelta de abaxo*, we find 0,62; 0,24; 0,14; and in the districts of pasturage (*ganaderia*), even 0,66; 0,20; 0,14. From these statements it results, that liberty diminishes in slave countries in proportion as cultivation and civilization augment.

II. In the *jurisdiction of the Quatro Villas*, and in those of Puerto Principe and Cuba, the progress of population is known with more exactness than in the western part. The *Quatro Villas* have felt the same effects which arise from the difference of the occupations of the inhabitants. In the districts of Santo Espiritu, where the farms of cattle prosper; at San Juan de los Remedios, where contraband trade is very frequent with the Bahama islands, the whites augmented from 1791 till 1811. While, on the contrary, they have diminished in the eminently fertile district of Trinidad, where the sugar-plantations have taken an extraordinary developement. At Villa Clara, the free men of colour gain on the other classes.

III. In the *jurisdiction of Puerto Principe*, the total population has nearly doubled in twenty years. Is has increased 0,89, as in the finest parts of the United States; and yet Puerto Principe is surrounded only with immense plains, where cattle, half wild, graze. The proprietors, says a recent traveller *, have no other care than to bury the money in their strong box, which they receive from the majordomo of the *hatos*, and to dig it up for gaming, and for the law-suits which are bequeathed from one generation to another.

IV. In the *jurisdiction of Cuba*, considered as a whole, the relations between the three classes have little changed during twenty years. The Partido de Bayamo continues to be distinguished by the great number of free men of colour (0,44), which increases from year to year, as at Holguin and Baracoa. The coffee-plantations prosper in the vicinity of Cuba, and furnish a very considerable augmentation of slaves †.

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* *Masse, sur l'Isle de Cuba*, 1825, p. 302.

† In the table just published by the secretary of the Consulado, M. del Valle Hernandez, (*Documentos*, p. 149, and

Patr., tom. ii, p. 283), the slaves of Bayamo are estimated at 16,733: this number neither agrees with the sum total 47,984, nor with the quotient 0,26. It being more probable that there was a typographical error in one amount than in two, I substituted the number of slaves (12,633), which is found at the same time by the quotient and the sum total. The table of the four districts of the province of Cuba is the result of enumerations *not modified;* it yields 106,331 for the population of the province of Cuba. *In the general table of the Island of Cuba* (*see* above, p. 116), the results of the *censo* are modified, either by reducing or augmenting them to round sums, as is said expressly in the *Docum.*, p. 137; the contradictions are consequently but apparent. I know not why, in the general table, the number of slaves has been diminished in the jurisdiction of Cuba only; but this change bears only upon one-tenth of the captive population of the eastern part of the island. As *variantes lectiones* exist in all the results of enumerations, I shall add that other *Padrones* gave in 1810, for the four districts of Cuba, 98,780; for the district (?) of Puerto Principe, 48,033. (*Docum.*, p. 137 and 150.) An enumeration of 1800 yielded for the Quatro Villas 53,267.

FOUR DISTRICTS OF THE PROVINCE OF CUBA.

DISTRICTS.	WHITES.	FREE MEN OF COLOUR.	SLAVES.	TOTAL.	RELATIONS OF THE THREE CLASSES TO THE TOTAL POPULATION.
Cuba 1791	7,926	6,698	5,213	19,837	0,40 0,33 0,27
1810	9,421	6,170	8,836	24,427	0,38 0,25 0,37
Baracoa 1791	850	1,381	169	2,400	0,35 0,57 0,08
1810	2,060	1,319	664	4,043	0,51 0,33 0,16
Holguin 1791	4,1	1,001	5,862	10,979	0,37 0,09 0,54
1810	8,534	4,542	16,850	29,926	0,28 0,13 0,59
Bayamo 1791	6,584	9,132	7,287	23,003	0,29 0,40 0,31
1810	14,498	20,853	12,633	47,984	0,30 0,44 0,26
Total 1791	19,476	18,212	18,521	56,219	0,34 0,33 0,33
1810	34,513	32,984	38,834	106,331	0,32 0,31 0,37

The number of female slaves was extremely small in the *sugar plantations*, till the latter years of the eighteenth century; and what may appear surprising is, that a prejudice founded on religious scruples opposed the introduction of women, whose price at the Havannah was generally a third less than that of men*. The slaves were forced to celibacy on the pretext of avoiding moral disorder. The Jesuits and the Bethlemite monks only had renounced that fatal prejudice, and encouraged negresses in their plantations. If the enumeration, no doubt imperfect, of 1775, yielded 15,562 women-slaves, and 29,366 men-slaves, we must not forget that this enumeration comprehended the totality of the island, and that the sugar plantations occupy even now but a quarter of the captive population. Since the year 1795, the *Consulado* of the Havannah began to be seriously occupied with the project of rendering the increase of the captive population more independent of the variations of the slave-trade. Don Francisco Arango, whose views were ever full of wisdom, proposed a tax on the plantations which had not a third of negresses among their slaves. He proposed also a tax of six piastres on every negro brought into the island, and from which the women *(negras baizales)*, should be exempted. Although these measures were not adopted, the *colonial assembly* refusing to employ coercive means, the desire of multiplying marriages, and taking better care of the children of the slaves, has existed since that period, when a *cedule royale* (of the 22d April, 1804), recommended those objects "to the conscience and humanity of the planters." The enumeration of 1817, yielded, according to Mr. Poinsett, 60,322 negress-slaves, and 106,521 negro-slaves. The relation of the black female slaves to the men, was, in 1777, as 1 : 1,9; and forty years later, it had scarcely sensibly changed *. It was = 1 : 1,7; the smallness of this change must be attributed to the immense number of *bozale negroes* imported since 1791, the introduction of negresses not having been considerable before 1817 to 1820; so that the negro-slaves who serve in the towns are become a small fraction of the total mass. In the *partido* of Batabano, which, in 1818, contained a population of 2078, with thirteen *ingenios* of sugar and seventy-three *cafetales*, there were 2226 negroes, and only 257 negress-slaves

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* *Documentos*, p. 34.

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* In the English islands, on a population of 627,777 slaves, were reckoned, in 1823: males, 308,467; females, 319,310, which consequently yields an excess of females of three and one-fifth per cent. Trinidad and Antigua only, like Demerara, contained more male than female slaves. See *Stat. Illustr. of the Brit. Emp.*, 1825, p. 54.

(relation = 8 : 1). In the jurisdiction of San Juan de los Remedios (which reckoned in 1817 a population of 13,700, with seventeen sugar-fabrics and seventy-three *cafetales*), there were 1200 negroes and 669 negress-slaves (relation = 1,9 : 1). In the jurisdiction of Filipinas (which reckoned in 1819 a population of 13,026), there were 2494 negroes and 997 negress-slaves (relation = 2,4 : 1); and if in the whole island of Cuba, the black male-slaves are to the female = 1,7 : 1, in the sugar-fabrics only they are scarcely = 4 : 1.

The first introduction of negroes into the eastern part of the island, took place in 1521, and did not exceed 300 in number. The Spaniards were then much less eager for slaves than the Portugueze; for, in 1539, there was a sale of 12,000 negroes at Lisbon *, as in our days (to the eternal shame of christian Europe) the slave-trade of Greeks is made at Constantinople and Smyrna. In the 16th century the slave-trade was not free in Spain; the court granted the privilege, which was bought in 1586, for all Spanish America, by Gaspar de Peralta; in 1595, by Gomez Reynel; and in 1615, by Antonio Rodriguez de Elvas. The total importation was then only 3500 negroes annually; and the inhabitants of Cuba, entirely engaged in rearing cattle, scarcely received any. During the war of succession, the French stopped at the Havannah to exchange slaves for tobacco. The *asiento* of the English quickened a little the introduction of negroes; yet in 1763, although the taking of the Havannah and the sojourn of strangers gave rise to new wants, the number of slaves in the jurisdiction of the Havannah did not attain 25,000; and in the whole island, not 32,000. The total number of African negroes, imported from 1521 to 1763, was probably * 60,000; their descendants exist among the free mulattoes, who inhabit for the most part the eastern side of the island. From the year 1763 to 1790, when the negro-trade was declared free, the Havannah received 24,875 (by the *Compañia de Tobacos* 4957, from 1763 to 1766; by the contract of the Marquess de Casa Enrile, 14,132, from 1773 to 1779; by the contract of Baker and Dawson, 5786, from 1786 to 1789). If we estimate the introduction of slaves in the eastern part of the island during those twenty-seven years (1763 to 1790) at 6000, we find from the discovery of the island of Cuba, or rather from 1521 to 1790, a total of 90,875. We shall soon see that by the ever increasing activity of the slave trade, the fifteen years that followed that of 1790, furnished more slaves than the two centuries and a half which preceded the period of the free trade. That activity was redoubled when it was stipulated between England and Spain, that the slave-trade should be prohibited north of the equator, from November 22d, 1817, and entirely abolished on the 30th May, 1820. The King of Spain accepted from England (which posterity will one day scarcely believe), a sum of 400,000 pounds sterling, as a compensation for the loss which might result from the cessation of that barbarous commerce. The following is the number of negroes brought into the port of the Havannah alone, according to the custom-house registers:

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* *Bryan Edwards, West. Ind.*, vol. iii, p. 202. *See* also above, vol. i, p. 277.

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* *Documentos*, p. 39 and 118.

1790.........	2534	1806.........	4395
1791.........	8498	1807.........	2565
1792.........	8528	1808.........	1607
1793	3777	1809.........	1162
1794.........	4164	1810.........	6672
1795.........	5832	1811.........	6349
1796.	5711	1812.........	6081
1797.........	4552	1813.........	4770
1798.........	2001	1814.........	4321
1799.........	4919	1815	9111
1800.........	4145	1816......	17,737
1801.........	1659	1817......	25,841
1802......	13,832	1818......	19,902
1803.........	9671	1819......	17,194
1804.........	8923	1820.........	4122
1805........	4999	Total in 31 years	225,574

The annual mean in this interval * of time 7470, and for the last ten years 11,542. This number may be augmented at least a fourth part, on account of the illicit commerce, the omissions at the customs, and the legal introduction by Trinidad and Santiago de Cuba: we therefore find

For the whole island,	from 1521 to 1763......	60,000
	from 1764 to 1790......	33,409
For the Havannah,	from 1791 to 1805......	91,211
	from 1806 to 1820......	131,829
		316,449
Augmentation for the illicit trade, and also for the eastern part of the island, from 1791 to 1820..		56,000
		372,449

We have seen above, that Jamaica received from Africa †, in those three hundred years, 850,000 blacks; or, to fix on a more certain estimate, in one hundred and eight years

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* Other manuscript-notes in my possession give, for 1817, 23,560 slaves.

† *See* vol. vi, p. 820. I shall here add, that the English colonies of the West Indies, which have now but 700,000 negroes and mulattoes, free and slaves, have received in one hundred and six years (from 1680 to 1786), according to the registers of the custom-house, 2,130,000 negroes from the coast of Africa!

(from 1700 to 1808) nearly 677,000; and yet that island does not now possess 380,000 blacks, free mulattoes and slaves. The island of Cuba furnishes a more consoling result; it has 130,000 free men of colour, while Jamaica, on a total population half as great, reckons only 35,000. The island of Cuba has received from Africa,

Before the year 1791	93,500
From 1791 to 1825 at least......	320,000
	413,500 blacks.

There was found in 1825, on account of the small number of negresses introduced by the slave trade, only

Free negroes and slaves	320,000
Mulattoes	70,000
Men of colour........................	390,000

A similar calculation, founded on numerical elements little different, was addressed to the *Cortes* of Spain, 20th July, 1811. It was attempted to be proved by this calculation, that the island of Cuba had received till the year 1810, less than 229,000 African negroes *, which it *represented* in 1811, by a captive and free population of negroes and mulattoes, amounting to 326,000, so that there is an excess of 97,000 on the African importation *. Forgetting that the whites have had their part in the existence of 70,000 mulattoes †, forgetting the natural increase of so many thousand negroes progressively imported, they exclaim,

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* According to a note published by the Consulado of the Havannah (*Papel periodico*, 1801, p. 12), the mean price of 15,647 *bozale negroes*, imported from 1797 to 1800, was 375 piastres per head. According to this rate, the 307,000

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blacks of Africa brought from 1790 to 1823, must have cost the inhabitants of the island the sum of 115,125,000 piastres.

* My calculation terminates in 1825, and yields 413,500 negroes imported since the conquest. This calculation transmitted to the Cortes, terminates in 1810, and yields 229;000. (*Documentos*, p. 119.) Difference 184,500 : now, according to the registers of the customs of the Havannah only, the number of *bozale negroes* imported, from 1811 to 1820, was beyond 109,000, which must be augmented, 1st. according to the principles admitted by the Consulado itself, ¼ or 27,000 for the illicit introduction in the eastern part of the island ; 2d. the produce of the illicit trade from 1811 to 1825.

† The task undertaken by the *Consulado* in 1811, on the probable distribution of 326,000 free men of colour and slaves, contains very remarkable materials, and which only a great knowledge of the localities could have furnished the administration. A) *Towns:* Western part ; at the Havannah, 27,000 free men of colour and 28,000 slaves; the seven pueblos of *Ayantamiento*, 13,000 ; in the whole jurisdiction of the Havannah, 36,000 free men of colour and 69,000 slaves, or 141,000. B) *Fields:* Jurisdiction of the Havannah, 6000 free men of colour and 110,000 slaves. Eastern part, 36,000 free men of colour and 53,000 slaves. Total of the fields (*campos*) 185,000. *Documentos sobre los negros*, p. 121.

"What other nation or human society can render so advantageous an account of the effects of that fatal trade of blacks *(disgraciado trafico) !*" I respect the sentiment that dictated these lines; and repeat, that in comparing the island of Cuba with Jamaica, the result of the comparison seems to be to the advantage of the Spanish legislation, and the morals of the inhabitants of Cuba. These comparisons demonstrate a state of things in the latter island more favorable to the physical preservation, and the setting free of the blacks; but what a melancholy spectacle is that of christian and civilized nations, discussing which of them has caused the fewest Africans to perish in three centuries, by reducing them to slavery! I shall not boast of the treatment of the blacks in the southern parts of the United States *; but degrees exist in the sufferings of the human species. The slave who has a hut and a family, is less miserable than he who is purchased, as if he formed part of a flock. The greater the number of slaves established with their families in a dwelling which they believe to be their own property, the more rapid will be their multiplication. The United States counted in

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* On the comparative state of the misery of the slaves of the West Indies and the United States, see *Negro Slavery in the United States of America and Jamaica*, 1823, p. 31. Jamaica reckoned, in 1823, male slaves, 170,466; females, 171,916: in the United States were found, in 1820, male slaves, 788,028; females, 750,100. It is not therefore the disproportion between the sexes that causes the want of increase natural to the West Indies.

1770	480,000 slaves.
1790	676,696
1800	894,444
1810	1,191,364
1820	1,541,568

The annual[*] increase of the last ten years (without counting the manumission of 100,000), was twenty-six on a thousand, which produces a doubling in twenty-seven years. Now, I assert with Mr. Cropper[†], that if the slaves at

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[*] The increase of the negro slaves, from 1790 to 1810 (514,668), is owing, 1st, to the natural augmentation in the families; 2d. to 30,000 negroes imported in the four years (1804 to 1808), during which South Carolina unhappily permitted again the importation by the slave-trade; 3d. to the acquisition of Louisiana, where there were 30,000 blacks. The augmentation resulting from the two latter causes, bears on one-eighth only of the total increase, and the compensation is found in the manumission of more than 100,000 blacks, who disappear, in 1810, from the registers. The slaves augment a little less rapidly (in the exact proportion of 0,2611 to 0,2915) than the totality of the population of the United States; but their increase is more rapid than that of the whites, where they form a considerable part of the population, as in the southern states. (*Morse, Mod. Geogr.*, 1822, p. 608.)

[†] *Letter addressed to the Liverpool Society*, 1823, p. 18.

Jamaica and Cuba had multiplied in the same proportion *, those two islands, the former since 1795, and the latter since 1800, would possess almost their actual population, without 400,000 blacks having been loaded with irons on the coast of Africa, and dragged to Port-Royal and the Havannah.

The mortality of the negroes is very different in the island of Cuba, as in all the West Indies, according to the kind of culture, the humanity of the masters and overseers, and the number of negresses who can take care of the sick. There are plantations in which fifteen to eighteen per cent perish annually. I have heard it coolly discussed, whether it were better for the proprietor not to fatigue the slaves to excess by labour, and consequently to replace them less frequently, or to draw all the advantage possible from them in a few years, and replace them oftener by the acquisition of *bozale negroes*.

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* The number 480,000 for the year 1770, is not founded on an effective enumeration; it is but an approximation. M. Albert Gallatin is of opinion, that the United States, which at the end of 1823 possessed a population of 1,665,000 slaves and 250,000 free men of colour, consequently a total of 1,915,000 negroes and mulattoes, never received from the coast of Africa more than 300,000 blacks, that is 1,830,000 less than the English West Indies received from 1680 to 1786; yet their present population in negroes and mulattoes scarcely surpasses the third of that of the United States.

Such are the reasonings of cupidity, when man employs man as a beast of burden! It would be unjust to entertain a doubt, that within fifteen years the mortality of the negroes has greatly diminished in the island of Cuba. Several proprietors have occupied themselves in a laudable manner in the amelioration of the system of plantations. The mean mortality of the negroes recently imported is still from ten to twelve per cent *; it might, from the experience of several well-governed fabrics, diminish from six to eight per cent. The loss of *bozale negroes* differs greatly according to the period of their arrival; the most favorable is that of October to January, when the season is healthy, and the abundance of aliments considerable in the plantations. In the hot months, the mortality is sometimes four per cent, *during the sale*, as happened in 1802. The increase of the number of female slaves, so useful by their care of their sick husbands and countrymen, the exemption from labor during their pregnancy, their solicitude for their children, the establishment of negroes by families in separate dwellings, the abundance of provisions, the multiplication of days of repose, and the introduction of moderate labor by task; such are the means most capable of preventing the destruction of the blacks. Persons who well know the internal system of the plantations believe, that in the actual state of things the number of black slaves would annually diminish one-twentieth, if the fraudulent slave-trade ceased altogether. This diminution is nearly equal to that of the Little English Antilles, if we except Saint Lucia and Grenada. Warned in the latter by parliamentary discussions, fifteen years before the definitive abolition of the slave-trade, they had time to augment the importation of negresses. The abolition in the island of Cuba was more sudden, and unexpected.

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* It is affirmed that at Martinico, where there are 78,000 slaves, the mean mortality is 6000. The births among the slaves amounts annually but to 1200. On the losses in the English islands, *see* above, vol. vi, p. 829. Before the abolition of the slave trade, Jamaica lost annually 7000 individuals, or 2½ per cent: since that period, the diminution of the population is almost null. *Review of the Registry Laws by the Com. of the Afric. Inst.*, 1820, p. 43.

In official publications at the Havannah, it has been attempted to compare the *relative population* (the relation of the population with the *area* of the island), with the relative population of the least peopled parts of France and Spain. The real *area* of the island being then unknown, these essays could not be exact. We have seen above, that the whole island contains nearly two hundred individuals by the square marine league (twenty to a degree). This is one-fifth less than the least peopled province of

Spain, that of Cuenca; four times less than the least peopled department of France, the Upper Alps. The inhabitants of the island of Cuba are so unequally distributed, that five-sixths of the island might almost be considered as unpeopled *. There are several parishes (Consolacion, Macuriges, Hanabana) where, in the middle of pasturages, we do not find fifteen inhabitants to the square league; on the contrary, in the triangle formed by Bahia Honda, Batabano, and Matanzas (or rather between Batabano, the Pan of Guaixabon, and Guamacaro), we find on 410 square leagues, or on one ninth of the total *area* of the island, more than 300,000 inhabitants, that is five-sevenths of the population of the island, and more than six sevenths of its agricultural and commercial wealth. This triangle furnishes but 732 inhabitants to the square league; it has not quite the extent of two departments of middling size in France, and a *relative population* one-half less considerable; but we must not forget that even in this small triangle, between Guaixabon, Guamauaro, and Batabano, the southern part is little peopled. The richest *Paroquias* in plantations of sugar, are those of Matanzas with Naranjal, or Cuba mocha and Yumuri; Rio Blanco del Norte with Madraga,

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* *Documentos*, p. 136. See also above, vol. vi, p. 187, 192.

Jibacoa, and Tapaste; Jaruoo, Guines and Managua with Rio Blanco del Sur, San Geronimo, and Canoa; Guanabacoa with Bajurayabo and Sibarimon; Batabano with Guara and Buenaventura; San Antonio with Govea; Guanajay with Bahiahonda and Guajaybon; Cano with Bauta and Guatao; Santiago with Hubajay and Trinidad. The most unpeopled Paroquias, which serve only for pastoral œconomy (*cria de ganado*), are, in the *Vuelta de abaxo*, those of Santa Cruz de los Pinos, Guanacape, Cacaragicaras, Pinal del Rio, Guane and Boxa; in the *Vuelta de arriba*, those of Macuriges, Hanabana, Guamacaro and Alvarez. The *hatos*, or farms of cattle which occupy deserts of 1600 to 1800 *caballerias*, disappear by degrees; and if the settlements attempted at Guantanamo and Nuevitas, have not had the rapid success which was justly expected; other settlements, those, for instance, of the jurisdiction of Guanajay, have perfectly answered. (*Expediente de Don Franc. de Arango*, 1798, manuscrit.)

We have remarked above, how much the population of the island of Cuba is susceptible of being augmented in the lapse of ages. As the native of a northern country, little favoured by nature, I shall observe that the Marche of Brandebourg, for the most part sandy, nourishes, under an administration favorable to the progress of agricultural industry, on a surface only one-third of that of Cuba, a population nearly double. The extreme inequality in the distribution of the population, the want of inhabitants on a great part of the coast, and its immense development, renders the military defence of the whole island impossible; the disembarking of an enemy cannot be hindered, nor illicit trade. The Havannah is no doubt well defended, and rivals by its works the most important places of Europe; the *Torreones*, and the fortifications of Cogimar, Jaruco, Matanzas, Mariel, Bahia Honda, Batabano, Xagua, and Trinidad, might oppose a longer or shorter resistance; but two-thirds of the island are almost without defence, and could scarcely be protected by the most active gunboats.

Intellectual cultivation, almost entirely restrained to the class of the whites, is as unequally distributed as the population. The first society of the Havannah resembles, in ease and politeness of manners, the society of Cadiz, and of the richest commercial towns of Europe; but quitting the capital, or the neighbouring plantations, inhabited by rich proprietors, a striking contrast to this state of partial and local civilization presents itself, in the simplicity of manners that prevails in the insulated farms and small towns. The Havaneros were the first among the rich inhabitants of the Spanish colonies, who visited Spain, France, and Italy; and at the Havannah the people were the best informed of the politics of Europe, and the springs put in movement in courts to sustain or overthrow a ministry. This knowledge of events, this prescience of future chances, have powerfully aided the inhabitants of the island of Cuba to free themselves from a part of the shackles which stop the development of colonial prosperity. In the interval of time that separated the peace of Versailles and the beginning of the revolution of Saint Domingo, the Havannah appeared ten times nearer Spain than Mexico, Caraccas, and New Grenada. Fifteen years later, at the period of my stay in the colonies, this appearance of inequality of distance had already considerably diminished; now, when the independence of the continental colonies, the importation of foreign industry, and the financial wants of the new states, have multiplied the connections between Europe and America; when the passage is shortened by the improvements in navigation; when the Columbians, the Mexicans, and the inhabitants of Guatimala*, rival each other in visiting Europe; the ancient Spanish colonies, those at least that are bathed by the Atlantic Ocean, seem alike to have drawn nearer to the continent. Such are the changes which a few years have produced, and which proceed with increasing rapidity. They are the effects of knowledge, and of an activity long restrained; and render the contrast less striking which I observed at the beginning of the century, in manners and civilization, at Caraccas, Bogota, Quito, Lima, Mexico, and the Havannah. The influence of the Basque, Catalanian, Galician, and Andalusian origin *, becomes every day more insensible; and perhaps at the period when I am tracing these lines, it would be unjust to characterize the different shades of national civilization in the six capitals I have just named, as I attempted to do elsewhere †.

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* *Los Centro-Americanos*, as they are called in the constitution of the federal Republic of Centro-America, decreed November 22d, 1824.

The island of Cuba does not possess those great and magnificent establishments of which the foundation dates far back at Mexico; but the Havannah can boast of institutions which the patriotism of the inhabitants, animated by a happy rivalship between the different centres of American civilization, will know how to extend and improve, when political circumstances and confidence in the preservation of internal tranquillity will permit. The patriotic society of the Havannah (established in 1793);

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* *See* above, vol. iii, p. 426.

† Vol iii, p. 471.

that of Santo Espiritu, Puerto Principe, and Trinidad, which depend on it; the university with its chairs of theology, jurisprudence, medicine *, and mathematics, established since 1728, in the convent of *Padres Predicadores* †; the chair of political economy, founded in 1818; that of agricultural botany; the museum and the school of descriptive anatomy, due to the enlightened zeal of Don Alexander Ramirez; the public library, the free school of drawing and painting; the national school; the Lancastrian schools, and the botanic garden, are institutions partly new, and partly old. Some wait for progressive ameliorations, others for a total reform, fitted to place them in harmony with the spirit of the age, and the wants of society.

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* At the Havannah only, in 1823, there were more than 500 practising physicians, surgeons, and pharmacians; namely, 61 medicos, 333 cirujanos latinos y romancistas, and 100 farmacenticos! There were reckoned in the whole island, in the same year, 312 advocates (of whom 198 were at the Havannah) and 94 escribanos. The increase of the advocates only, in 1814, was such, that there were still 84 at the Havannah, and 130 in the whole island.

† The clergy of the island of Cuba is neither numerous nor rich, if we except the bishop of the Havannah and the archbishop of Cuba, the former of whom has 110,000 piasters, and the latter 40,000 piasters of annual revenue. The canons have 3000 piasters. The number of ecclesiastics does not exceed 1100, according to the official enumeration in my possession.

Agriculture.—When the Spaniards began their settlements in the islands, and on the continent of America, the principal objects of the cultivation of the soil were as in Europe, the plants that serve to nourish man. This state of the agricultural life of nations, the most natural and encouraging for society, has been preserved till our days in Mexico, in Peru, in the cold and temperate regions of Cundinamarca, wherever the domination of the whites comprehends a vast extent of territory. The alimentary plants, bananas, manioc, maize, the cereals of Europe, potatoes and quinoa, have remained, at different heights above the level of the sea, the basis of continental agriculture between the tropics. Indigo, cotton, coffee, and the sugar-cane, appear in these regions only in intercalated groupes. Cuba, and the other islands of the archipelago of the Antilles, have, during two centuries and a half, presented the same aspect: the same plants were cultivated which had nourished the half-wild natives, and the vast savannahs of the great islands were peopled with numerous herds of cattle. Piedro de Atienza planted the first sugar-canes in Saint Domingo, about the year 1520; and cylindrical presses were constructed, moved by hydraulic wheels *; but the island of Cuba

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* On the *trapiches* or *molinos de agua* of the sixteenth century, *see* Oviedo, *Hist. nat. des Ind.*, lib. 4, cap. 8.

participated little in these efforts of rising industry; and, what is very remarkable, in 1553, the historians of the *Conquest* * mention no other exportation of sugar besides that of *Mexican* sugar for Spain and Peru. Far from throwing into commerce what we now call *colonial productions*, the Havannah, till the eighteenth century, exported only skins and leather. The rearing of cattle was succeeded by the cultivation of tobacco and the multiplication of bees, of which the first hives (*colmenares*) were brought from the Floridas. *Wax* and *tobacco* soon became more important objects of commerce than *leather*, but were shortly replaced in their turn by the *sugar cane* and *coffee*. The cultivation of these productions did not exclude more ancient cultivation; and, in the different phases of agricultural industry, notwithstanding the general tendency to make the plantations of coffee predominate, the fabrics of sugar furnish the greatest value of the annual productions. The exportation of tobacco, coffee, sugar, and wax, by lawful and illicit means, amounts to fourteen millions of piasters, according to the actual price of those articles.

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* Lopez de Gomara, Conquista de Mexico (*Medina del Campo* 1553), fol. 129.

Sugar.—The port of Havannah has exported, according to the registers in the custom-house, in the following sixty-four years:

From 1760 to 1763, mean year, at most	13,000 cases.
From 1770 to 1778	50,000
In 1786	63,274
1787	61,245
1788	69,221
1789	69,125
1790	77,896
1791	85,014
1792	72,854
1793	87,970
1794	103,629
1795	70,437
1796	120,374
1797	118,066
1798	134,872
1799	165,602
1800	142,097
1801	159,841
1802	204,404
1803	158,075
1804	193,955
1805	174,544
1806	156,510
1807	181,272
1808	125,875
1809	288,842
1810	186,672
From 1811 to 1814, mean year	206,487
In 1815	214,111
1816	200,487
1817	217,076

In 1818	207,378 cases.
1819	192,743
1820	215,593
1821	236,669
1822	261,795
1823	300,211
1824, year little fertile	245,329

This is the most extensive table hitherto published; it is founded on a great number of official manuscript pieces communicated to me, on the *Aurora* and the *Papel periodico de la Havana;* on the *Patriota Americano* (vol. ii, p. 59); on the *Guias de Forasteros de la Isla de Cuba;* on the *Sucinta Noticia de la situacion presente de la Havana,* 1800 (manuscript); on the *Reclamacion contra la ley de Aranceles,* 1821, and on the *Redactor general de Guatemala,* 1825 *Jul.*, p. 25. According to a less certain statement, 183,960 cases of sugar were embarked at the Havannah, and registered at the custom-house, from January 1st to November 5th, 1825. The two months of November and December are wanting, during which, in 1823, 23,600 cases were shipped at the same port.

In order to ascertain the whole exportation of sugar from the island of Cuba, we must add to the exportation of the Havannah, 1st. that of the other *authorised* ports, especially Matanzas, Santiago de Cuba, Trinidad, Baracoa, and

Mariel; 2dly, the produce of the illicit trade. During my stay in the island, the exportation of Trinidad, in Cuba, was estimated at only 25,000 cases. In examining the registers of the custom-house of Matanzas, we must avoid a *double enumeration*, and carefully distinguish [*] the sugar directly exported to Europe from that which is embarked for the Havannah. In 1819, the real transatlantic exportation of Matanzas was but one-fifteenth of that of the Havannah; and in 1823, I find one tenth; for, according to two tables of the custom-house, of which one presents the exportation of the Havannah only, and the other that of the Havannah and Matanzas, the former marks 300,211 cases of sugar and 895,924 arrobas of coffee; the latter 328,418 cases of sugar and 979,864 arrobas of coffee. From these statements, we may add to the 235,000 cases which the mean of the last eight years furnishes, for the Havannah only, at least 70,000 cases shipped in other ports; in estimating therefore the frauds on the custom-house at one-fourth, we receive for the exportation of the whole island, by lawful and illicit means, more than 380,000 cases (near seventy millions of kilograms) of sugar. Persons well acquainted with the localities, estimated [†] the consumption of the Havannah, in 1794, at 298,000 arrobas, or 18,600 cases of sugar, and the consumption of the whole island, at 730,000 arrobas, or 45,600 cases. If we consider that the population of the island at that period was * nearly 362,000, of which at most 230,000 were free men, and that it is now 715,000, of which 455,000 are free men, we must admit a total consumption, in 1825, of 88,000 cases. In fixing on 60,000, we obtain for the total production of the plantations of sugar-cane at least 440,000 cases, or eighty-one millions of kilog. This is a *limit-number* which would diminish but one-fifteenth, if we supposed that the estimate of the interior consumption in 1794 and 1825, was one-half too much.

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[*] *Letters from the Havannah*, p. 91, 95.

[†] *Historia natural y politica de la Isle de Cuba*, by Don Antonio Lopez Gomez, 1794 (manuscript), cap. 1, p. 22.

In order to judge more correctly of the agricultural wealth of Cuba, we shall compare the production of that island, in years of com-

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I know not on what researches the estimate was founded of the consumption of 25,000 to 30,000 cases in the whole island, which was given to me as an exact result, in 1804, before I had any knowledge of the manuscript of M. Lopez Gomez. Perhaps the consumption of the whole island was concluded from that of the Havannah, which can be controlled more easily. The quantity of sugar employed in that town, either in the fabrication of chocolate and sweetmeats, or in the aliments of the people, is beyond what can be imagined in Europe, even after having visited the south of Spain.

* *See* above, vol. vii, p. 393.

mon fertility, with the production and exportation of sugars in the rest of the West Indies, in Louisiana, Brazil, and Guyana *.

Island of Cuba, according to the estimates discussed above: production, at least 440,000 cases; exportation, by lawful means, 305,000 cases, or 56 millions of kilog.; contraband, 380,000 cases (70 millions of kilog.); consequently, nearly one-seventh less than the mean exportation of Jamaica.

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* In the following estimates, we have fixed on the results given by the *registers of the custom-house*, without augmenting the numbers, conformably to vague hypotheses, on the effects of illicit trade. It is supposed in the reduction of the weight 1 *quintal* or 4 *arrobas* = 100 Spanish pounds = $45^{kil},976$; 1 *arroba* = 25 Spanish pounds = $11^{kil},494$; 1 *caja de azucar* of the Havannah = 16 arrobas = $183^{kil},904$; 1 cwt = 112 English pounds = $50^{kil},796$. The last estimate is founded on the labors of Mr. Kelly, who supposes $453^{gr},544$ = 1 pound *avoir du poids*. Mr. Francœur, in calculating according to the weight of a cubic inch of distilled water, under the conditions indicated in the new English law, finds only $453^{gr},296$ in the *avoir du poids*, which gives 1 cwt = $50^{kil},769$, or to $\frac{5}{1000}$ near the result of the reduction of Mr. Riffault, in the second edition of *Thompson's Chemistry*, vol. i, p. 17. I have employed, according to Mr. Kelly, 1 cwt = $50^{kil},79$, but I considered it proper to mention the doubts that remain on so important an element. In the *Price Current* printed at the Havannah, the Spanish quintal is estimated at 46^{kil}: the reduction of a *Hundred Weight*, used in trade at Paris, is also $50^{kil},792$.

JAMAICA. Production* (that is, the interior consumption + the exportation) in 1812, according to an estimate of Mr. Colquhoun which appears a little high, 135,592 hogsheads, at 14 cwt, or 96,413,648 kil. The exportation in 1722, when the island had not 60,000 slaves, 11,008 hogsheads; in 1744, 35,000 hds; in 1768 (with 166,914 slaves), 55,761 hds, or 780,654 cwt †; in 1823 (with 342,382 slaves), 1,417,758 cwt ‡, or 72,007,928 kilograms. It results from these statements, that the exportation of Jamaica, in the very fertile year of 1823, was not one-eighteenth greater than that of the island of Cuba, which amounted in the same year, by lawful means, to 370,000 cases, or 68,080,000 kilograms. Taking the mean from 1816 to 1824, we find, from documents which I owe to the kindness of Mr. Charles Ellis, that the exportation of Jamaica to the ports of Great Britain and Ireland is 1,597,000 cwt (81,127,000 kil.).

BARBADOES (with 79,000 slaves); GRENADA (with 25,000 slaves); SAINT VINCENT (with 24,000 slaves); are the three islands of the

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* *Colquhoun, Wealth of the Brit. Emp.*, p. 378.

† *Stewart, View of the present state of Jamaica*, 1825, p. 17.

‡ *Stat. Illustr.*, p. 54. *See* Note A, at the end of the 10th Book.

English possessions which furnish most sugar. Their exportation for Great Britain, was, in 1812, 174,218 cwt.; 211,134 cwt.; and 220,514 cwt. In 1823, it was 314,630 cwt.; 247,360 cwt.; and 232,577 cwt. Barbadoes, Grenada, and Saint Vincent do not consequently export altogether a quantity of sugar equal to that sent annually to France from Guadaloupe and Martinique. The three English islands have 128,000 slaves and forty-three square marine leagues; the two French islands have 178,000 slaves and eighty-one square marine leagues. The island of Trinidad, which, after Cuba, Hayti, Jamaica, and Portorico, is the largest in the West Indies, has, according to MM. de Lindenau and Bauza, an *area* of 133 square leagues; yet, in 1823, it exported only 186,891 cwt. (9,494,000 kilog.), produce of the labor of 23,500 slaves. The progress of the cultivation of this island conquered from the Spaniards, has been so rapid, that in 1812, the production was only 59,000 cwt.

ENGLISH ISLANDS. The cultivation of the sugar-cane began at Jamaica as a branch of colonial industry in 1763. The exportation of the whole of the English islands, for the ports of Great Britain, was, mean year, from 1698 to 1712, 400,000 cwt.; from 1727 to 1733, a million of cwt.; from 1761 to 1765, 1,485,377 cwt.; from 1791 to 1795 (with 460,000 slaves), 2,021,325 cwt.; in the very fertile year of 1812, 3,112,734 cwt.; and in 1823 (with 627,000 slaves), 3,005,366 cwt.*. The mean, from 1816 to 1824, was 3,053,373 cwt. Jamaica now exports to the ports of Great Britain more than half the sugar of the English West Indies. Its slave-population is, to the total population of the English islands, as 1 : 1$\frac{8}{10}$. The exportation of the English islands for Ireland, is 185,000 cwt.

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* The year 1812, according to the work of Mr. Colquhoun, and 1825, according to the work recently published with the title of *Statistical Illustrations of the British Empire.* I became convinced by partial statements, that the exportations of 1812 and of 1823 belong nearly to the same islands that England possesses since the peace of Paris. The island of Tobago and Saint Lucia only are added, which yield 175,000 cwt. of sugar. The estimates anterior to the year 1812, are those of Mr. Edwards (*West. Ind.*, vol. i, p. 19), and relate to the same parts of the West Indies, with the exception of a few islands of very insignificant production. We may observe that from 1812, to the present period, the exportation of sugar for England has not augmented; yet no sensible change appears in the number of slaves, if we suppose that the omissions on the *registers* were the same in 1812 and 1825. In the former of those years were reckoned (with Saint Lucia, the Bahamas, and Bermuda), 634,100 slaves; in the latter, 630,800. Researches made before the publication of the Statistical Illustrations, had given me 626,800 slaves (vol. vi, p. 29). I would not make use of the tables published for the years 1807-1822, in which, under the name of the sugar of the English West Indies, are comprehended the exportation of the West Indies generally, an ephemeral conquest, and that of Dutch Guyana (Demerara, Berbice, and, before the peace of Paris, Surinam). This geographical confusion has given rise to the idea of a greater increase of production than really exists. The mean exportation, for instance, of 1809-1811, and 1815-1818, were (*Stat. Ill.* p. 56.) 3,570,803 and 3,540,993 cwt.; but deducting 870,000 cwt. from the sugar of English Amer-

French Islands. Exportation for France; 42 millions of kilograms. Guadaloupe exported in 1810, in refined sugar, 5,104,878 pounds; in coarse sugar, 37,791,300 pounds; Martinique, 53,059 casks (of a thousand pounds) of sugar, and 2,699,588 gallons (of four quarts) of molosses; thence results 95,955,238 pounds * for the two islands. The

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ica, for Demerara and Berbice, there remains for the fifteen islands now under the domination of England, only 3,185,000 cwt. The year 1822 only gives, with the same corrections, 2,933,700 cwt., and this result agrees within nearly one-forty-second with that which I gave in the text for the year 1823 (3,005,366 cwt.) Mr. Edwards, in the last edition of his excellent work on the West Indies, believes the mean exportation of the English islands, from the period of 1809 to 1811, to be 4,210,276 cwt. In this estimate, a third too high, the sugar of the West India islands has no doubt been confounded with that which arrives from Guyana, Brazil, and all the other parts of the world; for the *total importation* of sugar in Great Britain, was only 4,242,468 cwt., from 1809 to 1811, mean year.

* *Official Notes.*

French islands, from 1820 to 1823, imported into France, 142,427,968 kilog. of coarse sugar, and 19,041,840 kilog. of refined sugar; together, 161,469,808 kilog. which yield, mean year, 40,367,452 kilog. *.

ARCHIPELAGO OF THE WEST INDIES. In estimating the exportation of the little Dutch, Danish, and Swedish islands, which have only 61,000 slaves, at eighteen millions of kilograms, we find, for the exportation of the whole archipelago of the West Indies, in coarse and refined sugar, near 287 millions of kilograms, of which

165 millions or	$\frac{58}{100}$	the English Islands (626,800 slaves).
62	$\frac{22}{100}$	the Spanish Islands (281,400 slaves).
42	$\frac{14}{100}$	the French Islands (178,000 slaves).
18	$\frac{6}{100}$	the Dutch, Danish, and Swedish Islands (61,300 slaves).

The exportation of the sugar of Saint Domingo is at present almost nothing. It was 80,360,000 kilog. in 1788; and in 1799, it was believed to be twenty millions. If it had remained such as it was in the great prosperity of that island, it would have augmented the total exportation of the sugar of the West Indies twenty-eight-hundredths; but that of all America, scarcely eighteen-hundredths. Brazil, Guyana, and

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* *Rodet, de l'Entrepôt de Paris,* 1825, p. 150.

Cuba, with 2,526,000 slaves, now furnish altogether nearly 230 millions of kilograms, that is, without the contraband, three times as much sugar as Saint Domingo, in its greatest wealth. The enormous increase of cultivation since 1789 in Brazil, Demerara, and Cuba, has replaced what Hayti has diminished, and rendered insensible the want of sugar-factories in that republic.

THE ENGLISH, DUTCH, AND FRENCH GUYANAS. Total exportation, at least forty millions of kilograms. English Guyana, mean of 1816 to 1824, 557,000 cwt. or twenty-eight millions of kilog. The exportation in 1823, from Demerara and Essequebo to the ports of Great Britain, was 607,870 cwt. (with 77,370 slaves); from Berbice (with 23,400 slaves) 56,000 cwt.; total, 33,717,757 kilog. We may admit for Dutch Guyana *, or Surinam, nine or ten millions of

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* A Dutch author, M. Van den Bosch, in a very instructive work on the *Nedar landsche Bezittingen in Azia, Amerika en Afrika,* (1818, vol. ii, p. 188, 202, 204, 214), estimates the three colonies of Demerara, Essequebo, and Berbice, in 1814 (with 85,442 slaves) at an exportation of only 32,408,293 of sugar. Surinam, according to the same author, has scarcely 60,000 slaves, and exported in 1801, nearly 20,477,000 pounds of sugar. This exportation has since little varied; it is generally 17,000 casks (at 550 kilog.). Cayenne begins to yield one million of kil. The

kilograms. The exportation of Surinam in 1823, was 15,882,000 pounds; in 1824, 20,266,000. These statements were collected by M. Thuret, consul-general of the King of the Low Countries.

Brazil. The exportation of this vast country, which reckons 1,960,000 slaves, and where the sugar-cane is cultivated in the *Capitania-general* of the Rio Grande, as far as the parallel * of Porto Alegre (lat. 30° 2′), is much more considerable than is generally believed †. In

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estimate of the black population of the three Guyanas is perhaps one-seventh too high. (*See* above, vol. vi, p. 838).

* On the limits of the plants cultivated in the southern hemisphere, see *Auguste de Saint Hilaire, Aperçu d'un Voyage au Brésil*, p. 57. North of the tropic of Cancer, we find the production of sugar in Louisiana, in 1815, to be fifteen millions of pounds, or 7,350,000 kilograms. (*Pitkins*, p. 149).

† In the statistical work entitled, *Commerce du dix-neuvième siècle*, tom. ii, p. 238, the exportation of the sugar of Brazil for Europe is estimated at only 50,000 cases; but according to the registers of the custom-house at Hamburg, that port alone received in 1824, 44,800 cases of Brazilian sugar; and in 1825, more than 31,900 cases (at 650 kilog.). England and the Netherlands imported at the same period, more than 10,000 cases. According to official documents collected by Mr. Adrien Balbi, the exportation of Brazilian sugar to Portugal, in 1796, was 34,692,000 kilog.; in 1806, 36,018,000 kilog.; and in 1812, forty-five millions of kilograms.

1816, according to very exact information, it was 200,000 cases (at 650 kilog.), or 130 millions of kilograms, of which one-third was destined for Germany and Belgium, by Hamburgh, Breme, Trieste, Leghorn, and Genoa, and the rest for Portugal, France, and England; the latter country received, in 1823, only 71,438 cwt., or 3,628,335 kilog. This sugar is generally at a very high price on the coast of Brazil; the production of Brazilian sugar has diminished since 1816, on account of the interior commotions: in the years of great drought, the exportation scarcely rose to 140,000 cases. Persons well-informed on this branch of American commerce, believe, that when tranquillity shall be ultimately established, the exportation of sugar will become, mean year, 192,000 cases, or 125 millions of kilograms, of which 150,000 cases will be of refined sugar, and 42,000 of coarse sugar. Rio Janeiro, it is thought, will furnish 40,000 cases; Bahia, 100,000; Pernambuco, 52,000, without reckoning the years of extraordinary fertility.

EQUINOXIAL AMERICA and Louisiana now throw into the commerce of Europe and the United States, 460 millions of kilograms of sugar; (such is the result of the minute discussion of all the partial statements;) of this

287 millions or $\frac{64}{100}$ West Indies (1,147,500 slaves).
125 $\frac{27}{100}$ Brazil (2,060,000 slaves).
40 $\frac{6}{100}$ Guyanas (206,000 slaves).

We shall soon see that Great Britain only, with a population of 14,400,000, consumes more than the third of 460 kilograms, which the New Continent furnishes for the countries where the slave-trade has assembled 3,314,000 unfortunate slaves! The cultivation of the sugar-cane is now so spread over the different parts of the globe, that the physical or political causes which suspend or destroy the efforts of industry in one of the Great West India islands can no longer produce the same effect on the price of sugar and the general trade of Europe and the United States, as where great cultivation was concentrated in a small space. Spanish writers have often compared the island of Cuba, for the riches of its productions, to the mines of Guanaxuato in Mexico. In fact Guanaxuato furnished, at the commencement of the 19th century, a fourth of all the Mexican money, and a sixth of all the American money. The island of Cuba now exports by lawful means one eighth of all the sugar of the Archipelago of the West Indies; one-eighth of all the sugar of equinoxial America which abounds in Europe and the United States.

Three qualities of sugar are distinguished in the island of Cuba, according to the degree of purity which that substance attains by refining (*grados de purga*). In every loaf or reversed cone, the upper part gives the *white* sugar; the mean part the *yellow* sugar, or *quebrado;* the lower part, or point of the cone, the *cucurucho.* All the sugar of Cuba is consequently refined; a very small quantity is introduced of coarse or muscovade sugar (by corruption *azucar mascabado*). The forms being of a different size, the loaves (*panes*), differ also in weight. They generally weigh, after refining, an *arroba.* The refiners (*maestros de azucar*) will have every loaf of sugar render five-ninths of white, three-ninths of *quebrado,* and one-ninth of *cucurucho.* The price of white sugar is higher when sold alone, than in the sale called *surtido,* in which three-fifths of white sugar and two-fifths of *quebrado* are joined in the same lot. In the latter case the difference of the price is generally four reals (*reales de plata*) ; in the former, it rises to six or seven reals. The revolution of Saint Domingo, the prohibitions dictated by the *continental system,* the enormous consumption of sugar in England and the United States, the progress of cultivation in Cuba, Brazil, Demerara, Bourbon, and Java, have occasioned great fluctuations in the price. In a period of twelve years, it was from three to seven reals* in 1807, and from twenty-four to twenty-eight reals in 1818, which proves fluctuations in the relation of one to five. The price of sugar in England in the same space of time varied only † from thirty-three to thirty-seven shillings per quintal, that is, as one to two and one-fifth. In considering, not the price of the whole mean year, but that of the sugar of the Havannah at Liverpool, during the course of some months, we also find variations of thirty shillings, in 1811, and one hundred and thirty-four shillings in 1814, whence results the relation of one to four and two-fifths. The high price of sixteen to twenty reals the arroba, was kept up at the Havannah during five years, from 1810 to 1815, almost without interruption; while from 1822, the price has fallen a third, from ten to fourteen; and recently, in 1826, even from nine to thirteen reals. I enter into these details to give a more precise idea of the net produce of a sugar-fabric, and the sacrifices which a proprietor disposed to be satisfied with a more moderate profit can make to alleviate the condition of his slaves. The cultivation of sugar is still profitable with the actual price of twenty-four piasters per case (taking the mean between the *blanco* and the *quebrado*); a proprietor with a middling fabric, yielding eight hundred cases, now sells his harvest for 19,200 piastres, which twelve years ago was worth, at thirty-six piasters per case, 28,800 piasters.

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* In the price of sugar at the Havannah, the two numbers indicate the price of sugar *quebrado* and *blanco* by the *arroba*. A piaster contains eight reals, and is worth five franks forty-three cent.; it is worth thirteen cent. less in trade.

† *See* the tables of the price from 1807 to 1820, in *Stat. Illustrations of the Brit. Emp.*, p. 56, and from 1782 to 1822, in *Tooke on High and Low Prices*, 1824, Append. to part ii, p. 46, 53.

During my stay in the plains of Güines, in 1804, I endeavoured to obtain some accurate information on the *numeric elements* of the fabrication of the cane-sugar; a great *yngenio*, producing 32,000 to 40,000 *arr.* (367,000 to 460,000 kil.) of sugar, is generally fifty caballarias *, or 650 hectares in extent, of which the half (less than one-tenth of a square marine league), is allotted for the sugar-fabric properly so called *(cañaveral)*, and the other half for alimentary plants and pasturage *(potrero)*. The price of the land varies, naturally, according to the quality of the soil, and the proximity of the ports of the Havannah, Matanzas, and Mariel. In a circuit of twenty-five leagues round the

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* The agrarian measure, called *caballeria*, is eighteen cordels, (each cordel has twenty-four varas) or 432 square varas; consequently, as 1 vara = 0·835^{m}, according to Rodriguez, a *caballeria* is 186,624 square varas, or 130,118 square meters, or thirty-two and two-tenths English acres.

Havannah, the caballeria may be estimated at two or three thousand piasters. For a produce* of 32,000 arrobas (or 2000 cases of sugar), the *yngenio* must have at least three hundred negroes. An adult and acclimated slave is worth from four hundred and fifty to five hundred piasters; a bozale negro, adult, not acclimated, three hundred and seventy to four hundred piasters. It is probable that a negro costs annually, in nourishment, clothing, and medicine, forty-five to fifty piasters; consequently, with the interest of the capital, and deducting the holidays, more than twenty-two sols per day. The slaves are fed with *tasajo* (meat dried in the sun) of Buenos Ayres and Caraccas; salt-cod (*bacalao*), when the *tasajo* is too dear; and vegetables (*viandas*), such as calebasses, muñatos, batates, and maize. An arroba of tasajo was worth ten to twelve reals at Guines, in 1804; it now costs, 1825, fourteen to sixteen. An *yngenio*, such as we here suppose, (with a produce of 32,000 to 40,000 *arrobas*), requires 1st. three machines with cylinders put in motion by oxen (*trapiches*), or two hydraulic wheels; 2d. acoording to the ancient Spanish method, which, by a slow fire, causes a great consumption of wood, eighteen cauldrons (*piezas*); according to the fresh method of *reverberation* (introduced since the year 1801 by Mr. Bailli of Saint Domingo, under the auspices of Don Nicolas Calvo), three *clarificadoras*, three *peilas*, and two *traines de tachos* (each train has three *piezas*), in all twelve *fondos*. It is vulgarly asserted, that three *arrobas* of refined sugar, yield one barrel of *miel*, and that the molasses are sufficient for the expences of the plantation: this is especially the case where they produce brandy in abundance. Thirty-two thousand *arrobas* of sugar yield 15,000 *bariles de miel* (at two *arrobas*), of which five hundred *pipas de aguardiente de caña* are made, at twenty-five piasters. If a table of expence and production were formed from these statements, we should find for 1825:

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* There are very few plantations in the whole island of Cuba that can furnish 40,000 arrobas; such as the *yngenio* of Rio Blanco, or of the Marquess del Arca, Don Rafael Ofarrel, and Doña Felicia Jaurregui. The sugar-fabrics are thought to be very considerable that yield 2000 cases annually, or 32,000 arrobas (nearly 368,000 kilograms). In the French colonies, it is generally computed that the third or fourth part only of the land is allotted for the *plantation of food*, (bananas, ignames, and batates); in the Spanish colonies, a greater surface is lost in pasturage; this is the natural consequence of the ancient habits of the *haciendas de ganado*.

Value of 32,000 arr. of sugar (blanco and quebrado) at 24 piasters the case, or 16 arrobas	48,000 piasters.
Value of 500 *pipas de aguardiente*	12,500
	60,500 piasters.

The expence of the *yngenio* would be estimated yearly, at 30,000 piasters.

Now, the capital employed consists in

50 caballerias of land, at 2500 piasters...	125,000 piasters.
300 negroes, at 450 piasters	135,000
Buildings, mills	80,000
Cuves, cylinders, cattle, general inventory	130,000
	470,000 piasters.

From this calculation it results that, in establishing an *yngenio* at present, capable of furnishing two thousand *caxas* yearly, a capitalist would draw, according to the old Spanish method, and with the actual price of sugar, an interest of six and one-sixth per cent.; an interest not considerable for an establishment not merely agricultural, and of which the expence remains the same, although the produce sometimes diminishes more than a third. It is very rarely that one of those great *yngenios* can make 32,000 cases of sugar during several successive years. We must not therefore be surprised that when the price of sugar in the island of Cuba was very low (four or five piasters the quintal), the cultivation of rice was preferred to that of the sugar-cane. The profit of the ancient proprietors (*haciendados*) consists, 1st. in the circumstance that the expences of the settlement were much less twenty or thirty years past, when a caballeria of good land cost only 1200 or 1600 piasters, instead of 2500 to 3000; and the adult negro 300 piasters, instead of 450 to 500; 2d. in the compensation of the very low and the very high price of sugar. These prices are so different in a period of ten years, that the interest of the capital varies from five to fifteen per cent. In the year 1804, for instance, if the capital employed had been only 400,000 piasters, the raw produce, according to the value of sugar and brandy, would have amounted to 94,000 piasters. Now, from 1797 to 1800, the price of a case of sugar was sometimes, mean value *, forty piasters instead of twenty-four, which I was obliged to suppose in the calculation for the year 1825. When a fabric of sugar, a great manufacture, or a mine, is found in the hands of the person who first formed the establishment, the estimate of the rate of interest which the capital employed gives the proprietor, can be no guide to those who, purchasing afterwards, balance the advantages of different kinds of industry.

From the calculations I made at the island of Cuba, it appeared to me that a hectare yields, mean term, twelve cubemeters of vezou, from which may be drawn by the processes hitherto used, at most from ten to twelve per cent. of

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* *Papel periodico de la Hav.*, 1801, No. 12.

coarse sugar. At Bengal, according to Mr. Bockford, it requires six pounds of juice, and according to Mr. Roxburgh five and six-tenths; for twenty-eight decilitres of vezou furnish 450 gramms of coarse sugar. It results, that considering the vezou as a liquid charged with salt, it contains according to the fertility of the soil, twelve to sixteen per cent. of *cristallisable* sugar. The sugar-plant *(acer saccharinum)*, renders in good soils in the United States, 450 grammes of sugar for eighteen kilog. of sap, or two and a half per cent. The beetroot furnishes the same quantity of sugar, comparing that quantity with the whole weight of the tuberose root; 500 kilog. of coarse sugar are drawn from 20,000 kilog. of beetroot cultivated in a good soil. As the sugar-cane loses half its weight when the juice is expressed, it yields, in comparing, not the juice, but the tuberose root of the beta vulgaris to the loss of the saccharum officinarum, at an equal weight of vegetable mass, six times more coarse sugar than the beetroot. The juice of the sugar-cane varies in its constituent parts according to the nature of the soil, the quantity of rain, the distribution of heat in the different seasons, and the disposition more or less precose of the plant when in flower. It is not only, as is said by the *praticiens* or *maestros de azucar*, the sugared-part which is more or less diluted; the difference consists rather in the relations between the cristallizable and incristallizable sugar (liquid sugar of Mr. Proust), the allumine, the gum, the green fecula, and the malic acid. The quantity of crystallized sugar may be the same; and yet, according to the uniform processes employed, the quantity of cassonade drawn from the same volume of *vezou* differs considerably, on account of the variable relations of other principles that accompany the crystallizable sugar, which in combining with some of those principles, forms a syrup that has not the property of crystallizing, and remains in molasses. Too great an elevation of the temperature seems to accelerate and augment the loss. These considerations explain why the *maestros de azucar* regard themselves during a certain season as *bewitched*, because with the same care, they cannot *make the same quantity of sugar*; these considerations also explain, why with the same vezou, in modifying the process, for instance, the degree of heat and the rapidity of the boiling, more or less cassonade is obtained. It cannot be too often repeated, that it is not only from the construction and disposition of cauldrons and ovens that great economy must be expected in the fabrication of sugar; it is from the amelioration of chemical processes, a more intimate knowledge of the modes of action of lime, alcaline substances, and animal charcoal;

it is from the exact determination of the *maxima* of temperature to which the vezou ought to be successively exposed in different cauldrons. The ingenious analyses of sugar, starch, gum, and wood, made by MM. Gay-Lussac and Thénard; the labors undertaken in Europe on the sugar of grapes and beetroot; the researches of MM. Dutrone, Proust, Clarke, Higgins, Daniell, Howard, Braconnot, and Desrones, have facilitated and prepared those improvements; but every thing yet remains to be done on the spot, in the West Indies. It is certain that the Mexican amalgation cannot be ameliorated without having been examined, during a long stay at Guanaxuato or at Real del Monte, the nature of the mineral, when put in contact with mercury, the muriate of soda, the *magristal*, and lime; so also, in order to ameliorate the technical processes in the sugar fabrics, a chemist, who is well acquainted with the actual state of vegetable chemistry, must begin by analyzing in several *yngenios* of the island of Cuba, small quantities of *vezou* drawn from different soils, at different seasons of the year, either from ordinary or *créole* sugar-cane, from that of Otaheite, or from the red-cane of Guinea. Without this previous labor by a person recently employed in one of the most celebrated laboratories of Europe, and possessing a solid knowledge of the manufacture of the sugar from beetroot, some partial improvement may be attained; but the whole manufacture from the sugar-cane will remain what it now is, the result of essays more or less successful.

In soils that can be watered, or where plants with tuberose roots have preceded the cultivation of the sugar-cane, a caballeria of fertile land yields, instead of 1500 *arrobas*, three or four thousand, which makes 2660 or 3340 kilog. of sugar (*blanco* and *quebrado*) by the hectare. In fixing on 1500 *arr*, and estimating the case of sugar at 24 piasters, according to the price of the Havannah, we find that the hectare produces the value of 870 francs, in sugar; and that of 288 francs in wheat, in the supposition of an octuple harvest, and the price of a hundred kilog. of wheat, being 18 francs. I have observed elsewhere, that, in this comparison of the two branches of cultivation, it must not be forgotten that that of sugar requires a great capital, for instance, at present 400,000 piasters for an annual production of 32,000 *arrobas*, or 368,000 kilograms, if this quantity is made in one single settlement. At Bengal, in watered lands, an acre (4044 square meters) renders, according to MM. Bockford * and Roxburgh, 2300 kilog. of coarse sugar, which makes 5700 kilog. by the hectare. If this fertility is common in lands of great extent, we must not be surprised at the low price of sugar in the East Indies. The produce of a hectare is double that of the best soil in the West Indies, and the price of a free Indian day-labourer, is not one-third the price of the day-labour of a negro slave in the island of Cuba.

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* *Ind. Recreat.* (Calcutta, 1810, p. 75), Roxburg, Repertory, vol. ii, p. 425.

In Jamaica, in 1825, a plantation of five hundred *acres* (or fifteen and a half *caballerias*), of which two hundred acres are cultivated in sugar-cane, yields, by the labor of two hundred slaves, one hundred oxen, and fifty mules, 2800 cwt. or 142,200 kilog. of sugar, and is computed to be worth, with its slaves, 43,000 pounds sterling. According to this estimate of Mr. Stewart, one hectare would yield 1760 kilog. of coarse sugar; for such is the quality of the sugar delivered to commerce at Jamaica. We have seen above, that in reckoning in a great sugar-fabric of the Havannah 25 caballerias or 325 hectares for a produce of 32,000 to 40,000 cases, we find 1130 or 1420 kilog. of refined sugar (*blanco* and *quebrado*) by the hectare. This result agrees sufficiently with that of Jamaica, if we reflect on the loss sustained in the weight of sugar by refining, in converting the coarse sugar into *azucar blanco y quebrado*, or refined sugar. At Saint Domingo, a square is estimated (at 3403 square toises $= 1\frac{29}{100}$ hectare) at forty, and sometimes at sixty quintals: if we fix on 5000 pounds, we still find 1900 kilog. of coarse sugar by the hectare. In supposing, as we ought to do when speaking of the produce of the whole island of Cuba, that, in soils of mean fertility, the caballeria (at 13 hectares) yields 1500 arrobas of refined sugar (mixed with *blanco* and *quebrado*), or 1330 kilog. by the hectare, it results that 60,872 hectares, or nineteen five-fourths square marine leagues, (nearly a ninth of the extent of a department of France of middling size), suffice to produce the 440,000 cases of refined sugar, which the island of Cuba furnishes for its own consumption and for lawful and illicit exportation. It seems surprising that less than twenty square marine leagues can yield an annual produce of more than the value of fifty-two millions of francs (counting one case, at the Havannah, at the rate of twenty-four piasters). To furnish the coarse sugar wanted for the consumption of thirty millions of French, and which is actually from fifty-six to sixty millions of kilograms, it requires within the tropics *, but nine and five-sixths square marine leagues cultivated with sugar-cane; and in temperate climates, but thirty-seven and a half square marine leagues cultivated with beetroot! A hectare of *good* soil, sown or planted with beetroot, produces in France, from ten to thirty thousand kilograms of beetroot. The mean fertility is 20,000 kilog. which furnish 2½ per cent., or five hundred kilograms of coarse sugar. Now, one hundred kilog. of that sugar yield fifty kilog. of refined sugar, thirty of sugar *vergeoise*, and twenty of *muscovade;* consequently, a hectare of beetroot produces 250 kilog. of refined sugar.

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* M. Barruel reckons 67,567 acres of water and forests (11 square marine leagues) for 15 millions of kilog. of coarse sugar of beetroot. (*Moniteur* of March 22d, 1811.) I admit in the cultivation within the tropics, 1900 kilog. of coarse sugar

A short time before my arrival at the Havannah, some specimens had been sent from Germany of the sugar of beetroot, which was said to "menace the existence of the *sugar islands* in America." The planters had ascertained with alarm that it was a substance entirely similar to sugar-cane, but flattered themselves that the high price of labour in Europe, and the difficulty of separating the sugar

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by the hectare. I owe very precise information on the fabrication of the sugar of beetroot, to the obliging communications of the Baron De Lessert, my colleague at the Academy of Sciences, and who, by his botanical publications, his immense herbals, and a library alike well stored with works of science and of political economy, has facilitated, during so many years, the collection of the different parts of my *Voyage to the Equinoxial Regions.*

fit for cristallization from so great a mass of vegetable pulp, would render the operation on a grand scale little profitable. Chemistry has, since that period, succeeded in vanquishing those difficulties; and in the year 1812, France alone had more than two hundred manufactories of sugar of beetroot, that worked with very unequal success, and produced a million of kilograms of coarse sugar, that is, a *fifty-eighth* part of the actual consumption of sugar in France. Those two hundred fabrics are now reduced to fifteen or twenty, which, directed with intelligence, yield a produce of 300,000 kilog.* The inhabitants of the West Indies, well informed of the affairs of Europe, no longer fear beetroot, grapes, chesnuts, and mushrooms, nor the coffee of Naples, nor the indigo of the south of France. Fortunately, the hope of seeing the fate of the slaves of the West Indies changed, does not depend on the success of this little European cultivation.

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* Although the actual price of the cane-sugar not refined, is 1 fr. 50 cent. the kilog., in the ports, the fabrication of the sugar of beetroot offers a still greater advantage in certain localities, for instance, in the vicinity of Arras. These fabrics would be established in many other parts of France, if the price of the sugar of the West Indies rose to 2 francs, or 2 francs 25 cent. the kilogram, and that the government laid no tax on the sugar of beetroot, to compensate the loss of the custom-house on the consumption of colonial sugar. The fabrication of the sugar of beetroot is above all profitable when linked with a general system of rural œconomy, with the amelioration of the soil, and the nourishment of cattle: it is not a cultivation independent of local circumstances, like the cultivation of the sugar-cane in the tropics.

I have several times observed, that till 1762, the island of Cuba did not furnish more productions for trade, than the three last industrious and most neglected provinces with respect to cultivation, Veragua, the isthmus of Panama, and Darien, do at present. A political event which appeared extremely unfortunate, the taking of the Havannah by the English, roused the public mind. The town was evacuated in 1784, and its subsequent efforts of industry date from that memorable period. The construction of new fortifications on a gigantic plan * put a great deal of money suddenly into circulation; later, the slave-trade became free †, and furnished hands for the sugar manufacture. The liberty of commerce with all the ports of Spain, and sometimes with neutral states, the able administration of Don Luis de Las Casas, the establishment of the *Consulado* and the *Patriotic Society*, the destruction of the French colony of Saint Domingo ‡, and the rise in the price of sugar which was the natural consequence, the improvement in the machines and ovens, owing in great part to the refugees of Cape François, the more intimate connection formed between the proprietors of the sugar manufactories and the merchants of the Havannah, the great capitals employed by the latter in agricultural establishments (sugar and coffee plantations), such have been successively the causes of the increasing prosperity of the island of Cuba, notwithstanding the conflict of the authorities, which serves to embarrass the progress of affairs *.

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* It is affirmed, that the construction of the fort of *Cabaña* alone, cost 14 millions of piasters.

† *Real cedula de* 28 *de Febraro de* 1789.

‡ In three successive attempts, in August 1791, June, 1793, and October 1803. Above all, the unfortunate and

The greatest changes in the plantations of sugar-cane and the sugar manufactories, took place from 1796 to 1800: first, mules were substituted (*trapiches de mulas*) for oxen (*trapiches de bueyes*); and afterwards, hydraulic wheels were introduced (*trapiches de agua*), which the first *conquistadores* had employed at Saint Domingo; finally, the action of steam-engines was

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sanguinary expedition of Generals Leclerc and Rochambeau, completed the destruction of the sugar fabrics of Saint Domingo.

* The complication of *autoridades y jurisdicciones* is such that, in the memoir on the *present situation of the island of Cuba*, p. 40, twenty-five kinds of *Juzgados*, civil and ecclesiastic, are counted. This division of the supreme authority explains what was said above (p. 160), on the increasing number of advocates.

tried at Ceibabo, at the expence of the Count Jaruco y Mopex. There are now twenty-five of those machines in the different sugar mills of the island of Cuba. The culture of the sugar-cane of Otaheite became in the meantime more common. Boilers of preparation (*clarificadoras*) were introduced, and the reverberating furnaces better arranged. It must be said, to the honor of wealthy proprietors, that in a great number of plantations, a generous solicitude is displayed for sick slaves, for the introduction of negresses, and for the education of children.

The number of sugar manufactories (*yngenios*), in 1775, was 473 in the whole island; and in 1817, more than 780. Among the former, none produced the fourth part of the sugar now fabricated in the *yngenios* of second rank; it is consequently not the number of the sugar manufactories that can give an accurate idea of the progress of that branch of agricultural industry. There were reckoned in the province of the Havannah,

In 1763	70 sugar-houses.
1796	305
806	480
1817	625

TABLE OF THE AGRICULTURAL RICHES OF THE PROVINCE OF THE HAVANNAH, IN 1817.

PARTIDOS.	SUGAR-FABRICS (*Yngenios de azucar.*)	COFFEE-FABRICS (*cafetales*).	POTREROS *.	HACIENDAS DE CRIA.	PLANTATIONS (*vegas*) OF TOBACCO.	CHURCHES.	HOUSES.
Havannah	1	...	12	...	...	31	16,613
Villa de Santiago	43	17	190	..	30	32	3,327
Bejucal	49	14	62	...	...	6	872
Villa of San Antonio.	4	124	51	51	76	10	1,684
Guanajay	122	295	96	...	...	30	1,139
Guanabacoa	9	1	1	...	...	36	3,654
Filipinas	...	16	48	196	383	13	1,822
Jaruco	133	81	148	...	5	8	1,793
Guines	78	35	124	1	10	17	2,055
Matanzas	95	83	200	12	...	10	1,954
Santa Clara	14	78	220	267	100	7	3,441
Trinidad	77	35	45	403	150	24	3,914
Total	625	779	1197	930	1601	224	42,268

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* In order not to alter the characteristic features of the

In this table we distinguish the districts (Trinidad and Santa Clara) which still preserve their ancient predilection for pastoral life, and the establishment of *hatos* for breeding cattle; districts of tobacco (Filipinas, Trinidad); and finally those that most abound in plantations of sugar (Jaruco, Guanajay, Matanzas, and San Antonio Abad). Partial increase has been very remarkable; in 1796, there was in the *partido* of Jaruco and Rio Blanco del Norte only, and in the *partidos* of Guines and Matanzas, seventy-three, twenty-five, and twenty-seven sugar-fabrics; and in 1817, there existed one hundred and thirty-three, seventy-eight, and ninety-five.

The augmentation of tithes being in every zone, one of the most certain signs of the increase of agricutural wealth, we shall here

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agriculture of the Spanish colonies, I abstain from substituting French words for the Spanish words consecrated by long use. The *Hatos* or *Haciendas de cria* and the *Potreros* are all of them farms of cattle; but the former, often of an extent of two or three leagues in diameter, which are not inclosed, contain cattle almost wild, which require only the care of three or four men on horseback *(peones)*, who run over the country to discover the cows and mares who have brought forth, and to mark the young animals. The *Potreros* are inclosed pasturages, with a small part sometimes cultivated with maize, bananas, and manioc. There the animals produced in the *Hatos* are fattened, and the proprietors are also secondarily occupied by the multiplication of cattle *(de pequenas crias)*.

state its progress during fifteen years. The tithes *(rentas decimales arrendadas)* were farmed on the bishoprick of the Havannah * from four years to four years, as follows:

From 1789 to 1792 for..............	792,386 piasters
1793 to 1796 for.......	1,044,005
1797 to 1800 for..............	1,595,340
1801 to 1804 for..............	1,864,464

We see, that at the last period the tithes rose, mean year, to 2,330,000 francs, although the sugars pay but a half-tithe, or a twentieth.

In order to shew by the example of some years, the relations which, I will not say the production preserves, but the exportation of brandy and molasses *(miel de purga)* with the exportation of refined sugar, I shall here state the result of the years 1815-1824, from the registers of the custom-house of the Havannah.

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* *Official Documents,* in which the produce of forty *Paroquias* and the *Casas excusadas* is distinguished for every period; that is, the houses or habitations of which the tithes are reserved for the construction of churches and hospitals.

PERIODS.	PIPES OF BRANDY.	BOCOYES OF MOLASSES.	CASES OF REFINED SUGAR.
1815	3000	17,874	214,111
1816	1860	26,793	200,487
1817	....	30,759	217,076
1818	3219	34,990	207,378
1819	2830	30,845	192,743
1822	4633	34,604	261,795
1823	5780	30,145	300,211
1824	3691	27,046	245,329

According to the mean of the last five years, we find that the exportation of one thousand cases of refined sugar (183,904 kilog.), corresponds with the exportation of seventeen *pipas* of brandy, of sugar-cane, and one hundred and thirty *bocoyes* of molasses *.

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* *Une pipa de aguardiente* = 180 *frascos,* or 67½ gallons ; 1 *bocoy* = 6 *bariles.* The pipe *d'aguardiente de cana,* now worth twenty-five piasters at the Havannah, was worth more than thirty-five in 1815 to 1819. The *bocoy de miel de purga* was worth seven reales of plata. It is generally admitted that three loaves of sugar yield a *baril de miel de purga,* at two arrobas. In the terrage, after the first layer of moistened clay (*barro*) which has been trodden by the feet of animals under a shed (*piza*), is often put, another

The enormous expence of the great *yngenios*, and frequent domestic arrangements, the effects of luxury and disorder, too often place the proprietors in absolute dependence on the merchants*. The most common loans are an advance of capital to the *hacendado*, who furnishes every quintal of coffee at two piasters, and every arroba of sugar at two *reales de Plata* below the current price at the period of the harvest. Thus, a harvest of a thousand cases of sugar is sold by anticipation (or *refaccion*) with a loss of four thousand piasters. The multitude of affairs and the scarcity of money are so great at the Havannah, that the government itself is often compelled † to borrow at ten per cent., and private persons give twelve or fifteen. The enormous profits of the slave trade, which amount sometimes at the island of Cuba in a

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layer of clay (*barrillo*) is often added. In taking this off, the refined sugar is still left eight days in the cone (*horma*), so that the small residue of molasses may be entirely drained off (*para escurrir y limpiar*).

[*] By the contracts between the merchants who are capitalists, and the *haciendados*, the latter have sustained losses, especially on the construction of so many new fabrics of sugar, in 1798, of 30 to 40 per cent. The law prohibits loans exceeding 5 per cent, but its effect is avoided by fictitious contracts. (*Sedano, sobre la Decadencia del ramo de Azucar*, 1812, p. 17.)

[†] As in the *emprestito de la Intendencia de la Havana*, 5th November, 1804.

single voyage to one hundred and one hundred and twenty-five per cent. have much contributed to the rise of interest, several speculators having borrowed money at eighteen and twenty per cent. for the purposes of that vile and execrable commerce.

The first sugar-canes planted with care on a virgin soil yield a harvest during twenty to twenty-five years, after which they must be replanted every three years. There existed in 1804, at the Hacienda de Matamoros, a square *(cañaveral)* worked during forty-five years. The most fertile soil for the production of sugar is now in the vicinity of Mariel and Guanajay. That variety of sugar-cane known by the name of *Cana de Otahiti*, recognised at a distance by a fresher green, has the advantage of furnishing at the same time, on the same extent of soil, one-fourth more juice, and a stem which is more woody, thicker, and consequently richer in combustible matter. The refiners *(maestros de azucar)*, who have all the self-sufficiency of the half-learned, pretend that the *vezou (guarapo)* of the *Cena de Otahiti* is more easily marked, and yields more crystallized sugar by adding* less lime or potass of vezou. The sugar-cane of the South Sea furnishes no doubt after five or six years of cultivation, the thinnest stubble, but the knots remain more distant from each other than in the *Cana creolia* or *de la tierra*. The apprehension at first entertained of the former degenerating by degrees into ordinary sugar-cane * is happily not realized. The sugar-cane is planted in the island of Cuba in the rainy season from July to October; and the harvest is made from February to May.

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* At the moment the lime is added the froth blackens; the tallow and other fat substances cause the froth (*cachasa*) to descend to the bottom, and diminish it.

In proportion as by too rapid clearing the island is become unwooded, the sugar-houses have begun to want fuel. A little stalk (sugar-cane destitute of its juice) used to be employed to quicken the fire beneath the ancient cauldrons *(tachos)*; but it is only since the introduction of reverberating furnaces by the emigrants of Saint Domingo, that the attempt has been made to do altogether without wood, and burn only refuse sugar-cane. In the ancient construction of furnaces and cauldrons, a *tarea* of wood of one hundred and sixty cubic feet is burnt to produce five arrobas of sugar, or, for a hundred kilog. of raw sugar, 278 cubic feet of the wood of the lemon and orange trees are required. In the reverberating furnaces of Saint Domingo, a cart of refuse-cane of 495 cubic feet produced 640 pounds of coarse sugar, which make 158 cubic feet of refuse-cane for 100 kilog of sugar. I attempted during my stay at Guines, and especially at Rio Blanco, with the Count de Mopex, several new constructions, with the view of diminishing the expence of fuel, surrounding the focus with substances that conduct the heat badly, and thus causing the slaves to suffer less who keep up the fire. A long residence in the salt districts of Europe, and the labors of practical *halurgy*, to which I have been devoted since my early youth, had given me the idea of those constructions, which have been imitated with some success. Cuvercles of wood, placed on *clarificadoras*, accelerated the evaporations, and led me to believe that a system of cuvercles and moveable frames, furnished with a counter-weight, might extend to other cauldrons. This object merits further examination; but the quantity of *vezou* (*quarapo*), of the crystallized sugar extracted, and that which is destroyed, the fuel, the time, and the pecuniary expence, must be carefully estimated.

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* On these varieties, and the history of their introduction, *see* above, vol. iv, p. 84, 179. The sugar cases sent from the Mississipi in vessels laden with 3000, are of pine and cypress. They cost in 1804, from 14 to 18 reals a piece.

In the discussions on the possibility of replacing the sugar of the colonies in Europe by the sugar of beetroot, several assertions have been advanced on the price of the cane-sugar that are not correct. The following statements may serve for more exact comparisons. The price of colonial sugar * in Europe, is composed, 1st. of the primitive price of the acquisition; 2d. the freight and assurance; and 3dly. the custom-house dues. The price of the

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* It cannot now be doubted that the profit of the planters (*haciendados*) of the Havannah is much less than is generally believed in Europe; a very ancient calculation however of Don Jose Ignacio Echegoyen, on the *expence of the fabrication* of sugar appears to me somewhat exaggerated. He had great experience in the technical part, and computed that the annual expence of the manufacturer of 10,000 arr. of sugar was 12,767 piasters, and required a capital of 60,000 piasters. The expence would be consequently 55 francs per 100 kilograms; and supposing their value to be 65 francs (nearly 24 piasters of *caxa*), the capital of 60,000 piasters would yield, according to those unfavorable suppositions, an interest of only three and four-fifths per cent. This calculation, which was communicated to me at the Havannah, dates in 1798, a time when the expence of manufacture, and the purchase of land and negroes, was much less than at present. But we must not forget, 1st. that the molasses and the production of brandy, of which the *pipa* is worth 25 piasters, and which may amount to a fourth of the value of the sugar made, is not placed to account; 2d. that Mr. Echegoyen composed his memoir to prove how vexatious were the tithes on the production of sugar, and believed it a duty to exaggerate the expence of the *hacendados*. (*See* above, vol. vii, p. 178; *Patriota*, tom. ii, p. 63; and the memoir already mentioned of Don Diego Jose de Sedano, *sobre la Decadencia del ramo de Azucar*, 1812, p. 5.)

acquisition in the West Indies is now but the third of the price of the sale in Europe. When an equal mixture of white and brown sugar (*blanco y quebrado*) costs twelve reals of plata at the Havannah, the arroba, a *caxa*, at 184 kilog., is worth 126 francs, 48 cent.; consequently the price of 100 kilog. of refined sugar is 68 francs 69 centimes; estimating the piaster in this calculation at 5 francs 27 cent. In the French colonies, the primitive price is 50 francs for 100 kilograms of raw sugar, or 50 cent. the kilogram. The freight and assurance amount also to 50 cent. The taxes are 49 francs 50 cent. the 100 kilograms, or 49½ cent. the kilog.; whence results the total price in the ports of coarse sugar (for instance at Havre) 1 franc 50 cent. The juice of the beetroot, cultivated in temperate climates, contains but the third or the fourth of crystallized sugar * found in the

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* Count Chaptal supposes also, but 210 kilog. in coarse sugar by the 10,000 kilog. of roots of beetroot, or two and one-tenth per cent. of the whole weight. (*Chimie appliquée à l'Agr.*, tom. ii, p. 452.) As the roots, when well rasped, yield 70 per cent. of juice, it may be computed that, common year, 3½ per cent. of raw sugar is drawn from the juice of beetroot. In some parts of Touraine, this juice contains 5 per cent. of *crystullisable* sugar, as at Java, 25 and 30 per cent. of sugar is sometimes computed in the *vezou* of the sugar-cane! The produce of the hectare in that, however, differs for the lands of mean fertility but very little from the produce on which we fixed (p. 417) for the island of Cuba.

vezou or juice of the sugar-cane within the tropics; but the beetroot sugar gains in freight, assurance, and taxes, ten sols, or two-thirds of the total price per pound of saw sugar, on the sugar of the colonies. If the latter were entirely replaced by native sugar, the French customs would lose annually, in the actual state of things, near 29 millions of francs.

It is an error generally spread through Europe, and which has an influence on the manner of considering the effects of the cessation of the slave-trade, that in the West India islands called *sugar colonies*, the majority of the slaves are supposed to be employed in the production of sugar. The cultivation of the sugar-cane is no doubt a powerful motive for giving activity to the trade in blacks; but a very simple calculation proves that the total mass of slaves contained in the West Indies is nearly three times greater than the number employed in the production of sugar. I shewed, seven years ago *, that, if the 200,000 cases of sugar exported by the island of Cuba, in 1812, were produced in the great establishments, less than 30,000 slaves would have sufficed for that

Mr. Crawfurd estimates the English acre at Java, at 1285 pounds of avoir du poids weight of refined sugar, which makes 1445 kilograms by the hectare. (*Hist. of the Ind. Arch.*, vol. i, p. 476.)

* *Personal Narrative,* vol. iv, p. 236.

kind of labour. It ought to be recollected in the interests of humanity, that the evils of slavery weigh on a much greater number of individuals than the agricultural labours require, even admitting, which I am very far from doing, that sugar, coffee, indigo, and cotton, can be cultivated only by slaves. At the island of Cuba, one hundred and fifty blacks are generally reckoned for the fabrication of 1000 cases (184,000 kilog.) of refined sugar; or, in round numbers, a little more than 1200 kilog. per head of an adult slave *. A production of

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* At Saint Domingo, in five extensive habitations, one and four-fifths cultivating slaves was computed for one square; but in the plantations dispersed over the island, there are three slaves for one square, according to the documents of the Marquis of Galliffet; or, if the produce of a square (at $1\frac{29}{100}$ hectares) be 2500 kilograms of raw sugar, we find 833 kilograms per head. M. Moreau de Jonès has even shewn that the total mass of cultivated land in the French colonies yields but thirty-three and one-fifth quint., or 1640 kilog. by the square. (*Commerce au* 19$^{\text{me}}$ *siècle,* tom. ii, p. 308, 311.) At Jamaica, a negro is valued at only a hogshead of sugar (or 711 kilog.), according to Mr. Whitmore. The editor of the *Representation of the Consulado of the Havannah* to the Cortes, appears to have been struck with the greater quantity of sugar produced at Cuba with fewer negroes than at Jamaica. (*Documentos,* p. 36.) In the manuscript memoir, *Sucinta Noticia de la situacion de la Isla de Cuba, en Agosto* 1800, written by a rich proprietor of the Havannah, I find the following assertion: "Such is the immense fertility of our lands, that in fortunate positions we

440,000 cases would consequently require only 66,000 slaves. If we add 36,000 to that number, for the cultivation of coffee and tobacco in the island of Cuba, we find that about 100,000 of the 260,000 slaves which now exist there, would suffice for the three great branches of colonial industry on which the activity of commerce depends. Besides, tobacco is scarcely at all cultivated but by whites and free men. We have stated above (page 108), and I am justified in that assertion by the most respectable authority, that of the *Consulado of the Havannah,* that a third (32 p. c.) of the slaves inhabit the towns, and are consequently strangers to every kind of cultivation. Now, if we take into consideration, 1st. the number of children spread over the *haciendas* and incapable of labor; 2d. the necessity of employing in small plantations, or *dispersed cultivation,* a much more considerable number of negroes to produce the same quantity of sugar than in the *united cultivation,* or great fabrics, we find that on 187,000 slaves spread over the

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compute 160 to 180 arrobas, and in the totality of the island a hundred arrobas of white sugar per head of negroes. At Saint Domingo, the computation is sixty; and at Jamaica, seventy arrobas of raw sugar." In reducing these estimates to kilograms, they yield 1194 kilograms of refined sugar for Cuba, and 804 kilograms of raw sugar for Jamaica.

fields, there are at least a fourth part or 46,000 who produce neither sugar, coffee, nor tobacco. The slave trade is not merely barbarous, it is also unreasonable, because it misses the end it would obtain. It is like a current of water conveyed from a distance, of which more than half is turned away on the very spot from the lands for which it was destined. Those who repeat unceasingly, that sugar cannot be cultivated but by black slaves, seem to be ignorant that the archipelago of the West Indies contains 1,148,000 slaves, and that the whole mass of the colonial produce of the islands is obtained by the labor of only five or six hundred thousand *. Examine the actual state of industry at Brazil, calculate what hands are required to throw into the trade of Europe

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* To prove how far this calculation is from being exaggerated, we shall observe that the exportation of the archipelago of the West Indies is 287 millions of kilog. of sugar, and 38 millions of kilog. of coffee; and that reckoning in the great establishments, and for a mean fertility only, 800 kilog. of sugar, and 500 kilog. of coffee (produce of 2000 shrubs), per head of negroes, we find for the production of exported sugar and coffee 435,000 cultivators: let this number be augmented on account of the non-adults, and of a third less in the production of small plantations, or even of a half, and we shall not reach more than 652,000 slaves or 1,148,000, counting every age and both sexes, in the West Indies. (*See* above, vol. vi, p. 832.) The Consulado admitted, in 1811, 69,000 slaves in the towns, and 143,000 in the fields.

the sugar, coffee, and tobacco, that issue from its ports; visit those mines of gold so feebly worked in our days; and pronounce if the *industry of Brazil* requires that 1,960,000 blacks and mulattoes should be held in slavery. More than three-fourths of those Brazilian slaves [*] are neither occupied in gold washings, nor in the labors of colonial productions, which we are gravely told render the slave-trade a *necessary evil*, an *inevitable political crime!*

Coffee.—The cultivation of coffee dates, like the improvement of the construction of cauldrons in the sugar fabrics, from the arrival of the emigrants of Saint Domingo, especially from the years 1796 and 1798. A hectare yields 860 kilog. the produce of 3500 shrubs. The province of the Havannah reckoned:

In 1800........................	60 *cafetales.*
In 1817.......	779

The coffee tree being a shrub that yields a good harvest only in the fourth year, the exportation of coffee from the port of the Havannah was, in 1804, but 50,000 arrobas. It rose

In 1809 to	320,000 *arrobas.*
1815	918,263

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[*] A very intelligent traveller, M. Caldcleugh (*Travels in South America*, vol. i, p. 79), estimates also the Brazilian slaves at 1,800,000, although he supposes that the whole population is but three millions. (*See* above, vol. vi, p. 140.)

In 1816 to	370,229 *arrobas.*
1817	709,351
1818	779,618
1819	642,716
1820	686,046
1822	501,429
1823	895,924
1824	661,674

These numbers prove the great variations in the fraud on the customs, and the abundance of the harvests; for the results of the years 1815, 1816, and 1823, which might be thought less precise, have been recently verified on the registers of the custom-house. In 1815, when the price of coffee was fifteen piasters the quintal, the value of the exportation of the Havannah exceeded the sum of 3,443,000 piasters. In 1823, the exportation of the port of Matanzas was 84,440 arrobas; so that it seems not doubtful, that in years of mean fertility, the total exportation of the island, by lawful and illicit ways, is more than fourteen millions of kilograms.

I. Exportation registered, mean year, from 1818 to 1824;	
a) at the Havannah...............	694,000 arrobas.
b) at Matanzas, Trinidad, Santiago de Cuba, &c.	220,000
II. Fraud * on the customs	304,000
Total..............	1,218,000

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* According to the information taken on the spot, the fraud on the customs is much more considerable on the

From this calculation it results, that the exportation of coffee from the island of Cuba is greater than that of Java, estimated by Mr. Crawfurd *, in 1820, at 190,000 *piculs*, $11\frac{3}{5}$ millions of kilograms, and to that of Jamaica, which amounted †, in 1823, according to the

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exportation of coffee than of sugar: I estimated the former at one-fifth, the latter at one-fourth of *registered quantities*. Bags of coffee which ought to contain five arrobas, often hold seven and nine: of late, therefore, the proprietors have been required to make a *declaracion jurada*.

* It is by an erroneous reduction of tons into pounds of *avoir du poids* weight (supposing 54,260 tons = 486,158,960 pounds) that this estimable author has been led to consider the exportation of Java (25,840,000 pounds, or 11,628,000 kilograms), as two-sevenths of the exportation of the English West Indies, and one-thirteenth of the consumption of Europe. (*Hist. of the Indian Arch.*, vol. iii, p. 374.) The 54,260 tons (at 20 cwt., or 1016 kilog.) which Mr. Crawfurd regards as the consumption of coffee in Europe, is not equivalent to 218 millions of kilog., but to 55,128,000 kilog., a lower estimate than that on which I fixed in 1818. (*Per. Nar.*, vol. iv, p. 71 and 242.) It is believed that all Arabia does not throw into the commerce of Persia, India, and Europe, more than from seven to eight millions of kilog. of coffee. (*Page*, vol. i, p. 30.)

† Mr. Colquhoun estimated, in 1812, the exportation of Jamaica to the ports of the three united kingdoms, at 28,385,395 English pounds, or 12,773,427 kilog.; the importation of the whole English islands (without comprehending the islands temporarily conquered), at 31,871,612 English pounds, or 14,342,225 kilog. (*Wealth of the Brit. Emp.*, p. 378. *Per. Nar.*, vol. iv, p. 65—73.)

registers of the custom-house, but to 169,734 cwt., or 8,622,478 kilograms. In the same year, Great Britain received*, from all the English islands, 194,820 cwt., or 9,896,856 kilograms; which proves that Jamaica only produced six-sevenths. Guadaloupe delivered, in 1810, to the mother country, 1,017,190 kilog.; Martinico, 671,336 kilog. At Hayti, where the production of coffee before the French revolution was 37,240,000 kilograms, Port-au-Prince exported, in 1824, only 91,544,000 kilograms. It appears that the *total exportation of coffee from the archipelago of the West Indies by lawful means only, now amounts to more than thirty-eight millions of kilograms;* which is nearly five times the consumption of France, which from 1820 to 1823, was, mean year, 8,198,000 kilograms †. The consumption of Great Britain is yet ‡ but

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* *Stat. Illustr.*, p. 54. The exportation of English Guyana, in 1823, was 72,644 cwt., or 3,690,315 kilograms.

† *Rodet, on external commerce*, p. 153. It appears that of those eight millions of kilograms of coffee, Paris alone consumes 2½. *Chateauneuf, Rech. sur les consommations de Paris*, 1821, p. 107.

‡ Before the year 1807, when the tax on coffee was reduced, the consumption of Great Britain was not 8000 cwt. (less than ½ million of kilog.); in 1809, it rose to 45,071 cwt.; in 1810, to 49,147 cwt.; in 1823, to 71,000 cwt.; in 1824, to 66,000 cwt. (or 3,552,800 kilog.) *Report of the Com. of the Liverp. East India Assoc.*, 1822, p. 38; and *Nichols., Lond. Price Curr.*, 1825, p. 63.

3½ millions of kilograms; but the trade and the production of this article have so much augmented in the two hemispheres, that Great Britain has exported, in the different phases of her commerce:

In 1788..............	30,862 cwt. (at 50⅘ kilog.);
1793..............	96,167
1803..............	268,392
1812..............	641,131
1814..............	1,193,361
1818..............	456,615
1821..............	373,251
1822..............	321,140
1823..............	296,942

The exportation of 1814 was 60⅓ millions of kilograms, which we may suppose was at that period nearly the consumption of the whole of Europe. Great Britain (taking that denomination in its true sense, as denoting only England and Scotland), now consumes nearly two-thirds less coffee, and three times more sugar than France.

The price of sugar at the Havannah, is always counted by the *arroba* of 25 Spanish pounds (or 11^{kil},49), and the price of coffee by the quintal (or 45^{kil},97). We have seen the latter oscillate from 4 to 30 piasters; it even went down in 1808, below 24 *reals*. The price of 1815 and 1819, was between 13 and 17 piasters the quintal; coffee is now at 12 piasters. It is probable that the cultivation of coffee scarcely employs in the whole island of Cuba 28,000 slaves, who produce, mean year, 305,000 Spanish quintals (14 millions of kilograms), or, according to the present value, 3,660,000 piasters; while 66,000 negroes produce 440,000 cases (81 millions of kilograms) of sugar, which, at the price of 24 piasters, is worth 10,560,000 piasters. It results from this calculation, that a slave now produces the value of 130 piasters of coffee, and 160 piasters of sugar. It is almost useless to observe, that these relations change with the price of the two articles, of which the variations are often opposite, and that, in calculations which may throw some light on agriculture in the tropical region, I comprehend in the same point of view, the interior consumption, and the exportation by lawful and illicit means.

Tobacco.—The tobacco of the island of Cuba is celebrated in every part of Europe, where the custom of smoking, borrowed from the natives of Hayti, was introduced towards the end of the sixteenth and the beginning of the seventeenth century. It was generally hoped that the cultivation of tobacco, freed from all the shackles of an odious monopoly, would furnish the Havannah with a very considerable object of commerce. The benevolent intentions displayed by the government within six years, in abolishing the *Factoria de tabacos*, has not produced the amelioration in that branch of industry which was expected. The cultivators want capital, the farms are become extremely dear, and the predilection for the cultivation of coffee is prejudicial to that of tobacco.

The most ancient statements we possess on the quantity of tobacco which the island of Cuba has thrown into the magazines of the mother country, go back to 1748. According to the Abbé Raynal, a much more exact writer than is generally believed, that quantity, from 1748 to 1753, mean year, was 75,000 arrobas. From 1789 to 1794, the produce of the island amounted annually to 250,000 arrobas; but from that period to 1803, the increased price of land, the attention given exclusively to the *cafétières* and the sugar factories, little vexations in the exercise of the royal monopoly (*estanco*) and the shackles of external trade, have progressively diminished the production more than one-half. The total production, however, of tobacco in the island, is believed to have been from 1822 to 1825 again from three to four hundred thousand arrobas.

The interior consumption of tobacco in the whole island, is more than 200,000 arrobas. The *Company of Commerce of the Havannah*, till 1761, delivered the tobacco of Cuba to the royal manufactures of the peninsula, according to contracts renewed from time to time with the treasury or *Real Hacienda.* The government (*Factoria de tabacos*) replaced this company, and worked the monopoly itself. The price paid to three classes of cultivators (*suprema, mediana, y infima,*) was reduced: these prices were in 1804, six, three, and two and a half piasters the *arroba.* In comparing the diversity of price with the quantity produced, we find that the royal factory paid for the leaves of tobacco, at the mean price of 16 piasters the quintal. On account of the expence of fabrication, a pound of *cigarros* cost the administration, at the Havannah, 6 *reals* (or ¾ piasters); a pound of tobacco in powder, in *polvos delgados con color,* 3½ *reals,* and in *polvos suaves* or *cucaracheros* of Seville, 1½ *reals.*

In good years, when the harvest (the produce of the advances made by the factory to cultivators ill at ease) rose to 350,000 *arrobas* of leaves, 128,000 *arrobas* were fabricated for the peninsula, 80,000 for the Havannah, 9200 for Peru, 6000 for Panama, 3000 for Buenos Ayres, 2240 for Mexico, and 1000 for Caraccas and Campechy *. To complete the sum of 315,000,000

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* *De la situacion actual de la Real Factoria de Tabacos de la Havana en Abril* 1804 (official manuscript document). Ten to twelve millions of pounds of tobacco were sometimes

(for the harvest loses ten per cent. of its weight, in *merma y aberias*, during the preparation and the transport), we must suppose that 80,000 *arrobas* were consumed in the interior of the island (*en los campos*), where the monopoly and the taxes were not exercised. The maintenance of 120 slaves and the expence of the manufacture amounted but to 12,000 piasters annually; the persons employed in the *Factoria* cost 54,100 piasters *. The value of 128,000 arrobas, which in good years was sent to Spain, either in cigars or in snuff (*rama y polvos*), often exceeded five millions of piasters, according to the common price of Spain. It seems surprising to see that the statements of exportation from the Havannah (documents published by the *Consulado*) mark the exportations for 1816, at only 3400 *arrobas;* for 1823, but 13,900 arrobas of *tabac en rama*, and 71,000 pounds of *tabac torcido*, estimated together, at the custom-house, at 281,000 piasters; for 1825, but 70,302 pounds of cigars, and 167,100 pounds

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accumulated at Seville, and the revenue of the *Renta del Tabaco* of the Peninsula, in good years, was six millions of piasters.

* We see in the statements of the *Royal Treasury*, published in 1822, that after the suppression of the *Factories of Tobacco* at the Havannah, the expence of keeping up the building, and the appointments of persons who had obtained a retreat, still cost 18,600 and 24,800 piasters annually.

of tobacco in leaves; but it must be remembered, that no branch of contraband is more active than that of cigars. Although the tobacco of the *Vuelta de abaxo* is the most famous, a considerable exportation of it is made in the eastern part of the island. I rather doubt the total exportation of 200,000 boxes of cigars (value two millions of piasters), which several travellers admit for these latter years. If the harvests were abundant to such a point, why should the island of Cuba receive tobacco from the United States for the consumption of the lower class of people?

After sugar, coffee, and tobacco, three productions of high importance, I will not speak of the cotton, the indigo, and the wheat of the island of Cuba. These branches of colonial industry are little fruitful; and the proximity of the United States and Guatimala render the competition almost impossible. The state of Salvador, belonging to the Confederation of *Centro-America*, now throws 12,000 *tercios* annually, or 1,800,000 pounds of indigo into trade; an exportation which amounts to more than two millions of piasters. The cultivation of wheat succeeds to the great astonishment of travellers who have passed through Mexico, near the Quatro Villas, at small heights above the level of the ocean, although in general it is but little developed. The flour is fine; but the colonial productions are more tempting, and the fields of the United States, that Crimea of the New World, yield harvests too abundant for the commerce of native cereals to be efficaciously protected by the prohibitive system of the custom-house, in an island near the mouth of the Mississipi and the Delaware. Analogous difficulties oppose the cultivation of flax, hemp, and the vine. The inhabitants of Cuba are perhaps ignorant themselves, that, in the first years of the *conquest* by the Spaniards, wine was made in their island of wild grapes *. This kind of vine, peculiar to America, has given rise to the general error, that the true *vitis vinifera* is common to the two continents. The *parras monteses*, which yields " the wine somewhat sour of the island of Cuba," was probably gathered on the *vitis tiliæfolia* which Mr. Willdenow has described from our herbals. In no part of the northern hemisphere has the vine hitherto been cultivated * with the view of producing wine, south of the 27° 48′, or the latitude of the Isle de Ferro, one of the Canaries, and of 29° 2′, or the latitude of Abuscher in Persia.

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* " *De muchas parras monteses cod ubas se ha cogido vino aunque algo agrio.*" (Herera, Dec. I, p. 233.) Gabriel de Cabrera found a tradition at Cuba similar to that which the people of semitic race have of Noah, experiencing for the first time the effect of a fermented liquor. He adds, that the idea of two races of men, one naked, another clothed, is linked to the American tradition. Has Cabrera, pre-occupied by the rites of the Hebrews, ill interpreted the words of the natives, or, which seems more probable, has he added something more to the analogies of the *woman-serpent*, the

WAX.—This is not the produce of native bees (Melipones of M. Latreille), but of bees brought from Europe by Florida. This commerce has only become important since 1772. The exportation of the whole island, which from 1774 to 1779 was only 2700 arrobas †, mean year, was estimated in 1803, comprehending the fraud on the custom-house, at 42,700 arrobas, of which 25,000 were destined for Vera Cruz. The churches of Mexico make a great consumption of the wax of Cuba. The price varies from sixteen to twenty piasters the arroba. The exportation from the Havannah only, according to the custom-house registers, were

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conflict of two brothers, the *cataclysm of water*, the *raft of Coxcox*, the *exploring-bird*, and of many other things that teach us incontestably that there existed a community of antique traditions between the nations of the two worlds? *See my Views of the Cordilleras and Monuments of America*, Pl. 13 and 26; vol. i, p. 114, 235, 237, 376; vol. ii, p. 14, 128, 173, 199, 392 (ed. in 8vo.)

* *Leopold de Buch, Phys. Beschr. der Canar. Inschn.*, 1825, p. 124.

† Raynal, tom. iii, p. 257.

In 1815	23,398 *arrobas.*
1816	22,365
1817	20,076
1818	24,156
1819	19,373
1820	16,939
1822	14,450
1823	15,692
1824	16,058
1825	16,505

Trinidad and the small port of Baracoa have also a considerable trade in wax, furnished by the almost uncultivated regions on the east of the island. In the proximity of the sugar-factories many bees perish of *inebriety* from the molasses, of which they are extremely fond. In general the production of wax diminishes in proportion as the cultivation of the land augments. The exportation of wax according to the present price, by lawful and fraudulent means, is an object of half a million of piasters.

Commerce.—We have already observed in another place, that the importance of the commerce of the island of Cuba is not founded solely on the riches of its productions, and the wants of the population in the articles and merchandize of Europe, but also in great part on the favorable position of the port of the Havannah, at the entrance of the Gulph of Mexico, where the high roads of the commercial nations of both worlds cross each other. The Abbe Raynal has said *, that "at a period when agriculture and industry were in their infancy, and scarcely threw into commerce the value of two millions of piasters in sugar and tobacco, the *island of Cuba alone might be worth a kingdom to Spain.*" There seems to have been something prophetic in those memorable words; and since the parent state has lost Mexico, Peru, and so many other colonies declared independent, they ought to be seriously considered by statesmen who are called upon to discuss the political interests of the peninsula.

The island of Cuba, to which for a long time the court of Madrid wisely granted great liberty of commerce, exports, by lawful and illicit means, of its own native productions, in sugar, coffee, tobacco, wax, and skins, to the value of more than fourteen millions of piasters †; which is about a third less than the value of the precious metals that Mexico furnished at the period of[*] the greatest prosperity of its mines. It may be said that the Havannah and Vera Cruz[†] are to the rest of America what New York is to the United States. The tonnage of 1000 to 1200 merchant vessels that annually enter the port of the Havannah, amounts (excluding the small coasting embarcations), to 150,000 or 170,000 tons[‡]. We often see also in time of peace, one hundred and twenty to one hundred and fifty ships of war anchor at the Havannah. From 1815 to 1819, the productions registered at the custom-house of that port only (sugar, brandy, molasses, coffee, wax, and butter) attained, mean year, the value of 11,245,000 piasters. In 1823, the exportation registered two-thirds less than their effective price, amounted (deducting 1,179,000 piasters in specie) to more than 12½ millions of piasters. It is probable that the importations of the whole island, made by lawful and fraudulent means, and estimated at the real price of the articles, the merchandize and the slaves, amount at present to fifteen or sixteen millions of piasters, of which scarcely three or four millions are re-exported. The Havannah purchases from abroad far beyond its own wants, and exchanges its colonial articles for the productions of the manufactures of Europe, to sell a part of them at Vera Cruz, Truxillo, Guayra, and Carthagena.

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* *Hist. Philos.*, tom. iii, p. 257.

† At the low price of late years we may reckon among those productions: 380,000 cases of sugar (at 24 piasters) = 9,120,000 piasters; 305,000 quintals of coffee (at 12 piasters) = 3,660,000 piasters. (*See* above, p. 165, 177, and 210.) According to the price of those articles, from 1810 to 1815, the value of the exportations of the island of Cuba would amount at present to eighteen or nineteen millions of piasters. Fortunately the production or the quantity of sugar fabricated has augmented in proportion as the price has lowered; that price, in 1826, is scarcely 22 piasters the case, while in 1801, it rose to 40 piasters.

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[*] In 1805, gold and silver money was struck at Mexico, to the value of 27,165,888 piasters; but, taking a mean of ten years of political tranquillity, we find from 1800 to 1810, scarcely 24½ millions of piasters.

[†] In 1803: importation of Vera Cruz, 15 millions of piasters; exportation (not comprehending the precious metals), 5 millions of piasters. The re-exportations at the Havannah commenced by the establishment of the *depôt*.

[‡] In 1816, the tonnage of the commerce of New York was 299,617 tons; that of Boston, 143,420 tons. The capacity of the ships is not always an exact measure of the wealth of commerce. The countries which export rice, flour, hewn wood, and cotton, want more tonnage than the tropical regions, of which the productions (cochineal, indigo, sugar, and coffee) take up little volume, although of considerable value.

I discussed in another work*, fifteen years ago, the elements of the tables which are published by the erroneous denomination of *balance of commerce;* I observed how little confidence these accounts merit, which are opened between nations who make mutual exchanges, and where by false principles of political economy, the advantages are only appreciated according to the amount of the payment in specie. The following statements furnish two years (1816 and 1823) of the *Balanzas y Estados de Comercia,* made by order of the government. I have not altered a single figure, because they afford (a great advantage in quantities difficult to be known), the *minimum of the limit numbers.* The prices indicated in these statements are neither those of the productions at the place of their origin, nor those which regulate the markets at the ports where they arrive. They are fictitious estimates, an *official value,* as they say in the system of the custom-house* of Great Britain; and are, it cannot be too often repeated, at least a third below the current price. To deduct from the state of commerce at the Havannah, such as we find it in the registers of the Spanish custom-house, the state of commerce of the whole island, we must know the *registered* exportations and importations of all the other ports, and augment their sum total by the produce of the contraband trade, which differs according to the spot, the nature of the merchandize, and the variable price from year to year. Calculations of this nature can only be attempted by the local authorities; and what they published in the struggle they very able sustained with the Cortes of Spain, proves that they do not think themselves sufficiently prepared for a task which comprehends so many objects at the same time.

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* *Polit. Essay,* vol. iv, p. 121, &c.; and *Per. Nar.,* vol. vi, p. 225.

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* We distinguish in this system between the real price, the *official value,* and the *declared* or *bonâ fide value.*

The *Junta del Gobierno* and the *Real Consulado* appear annually, for the port of the Havannah only, by the name of the *Balanza del Comercio* *, and contain a statement of the exportations and importations registered at the custom-house. We distinguish in these statements the importations by national (Spanish) and foreign ships; the exportations for the peninsula, for the Spanish ports of America, and those beyond the domain of the crown of Spain. The weight of the merchandize, its value *(valor por ajaros)*, and the municipal and royal dues, are added; but the *official* estimate of the price of merchandize is, as we have already observed, much below the current price † of the place.

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* These *Balanzas del Commercio* of the Havannah, some of which are printed with all the minute detail of partial estimates, generally form twenty-five to thirty pages in folio, and contain more than 1800 articles. I possess a great number; but, in this *Political Essay on the Island of Cuba,* I only publish the figures that can lead to any general result. I followed the same rule in my *Political Essay on New Spain.*

† For instance, the negroes imported are valued at one hundred and fifty piasters per head; the barrels of flour at ten piasters. After having given the total value of the pretended *balance of trade,* I indicated the quantities of gold and silver which only *traversed* the island of Cuba. To give an approximative idea of the interior consumption of the

YEAR 1816.

			PIASTERS.
A. IMPORTATION			13,219,986
By 336 Spanish ships		5,980,443 p.	
Articles and merchandize	1,032,135 p.		
African slaves	2,659,950		
In gold and silver	2,288,358		
By 672 foreign ships		7,239,543	
1008 ships		13,219,986	
B. EXPORTATION			8,363,135
By 497 Spanish ships		5,167,966 p.	
For the peninsula	2,419,224 p.		
For the Spanish ports of America	2,104,890		
For the coast of Africa	643,852		
	5,167,966		
By 492 foreign ships		3,195,169	
989		8,363,135	

Of the 2,439,991 piasters, the registered exportation in gold and silver, amounted to only 480,840 piasters.

Among the articles of *importation* we distinguish the following values: flour, 71,807 barrels, or 718,921 p.; wines and liquors of Europe, 463,067 p.; salt-meat, provisions, spiceries, 1,096,791 p.; various kinds of clothing,

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island, and its wants in objects manufactured in Europe, I marked the same articles among the exportations and importations.

127,681 p.; silk, 282,382 p.; linen, 3,226,859 p.; woollen cloth and other tissues of flannels, 103,224 p.; furniture, crystals, metals, 267,312 p.; paper, 61,486 p.; wrought iron, 330,368 p.; leather and skins, 135,103 p.; planks and other wood (timber) already worked, 285, 217 p.

Among the articles of *exportation*, we find: flour, 10,965 bar., or 145,254 p.; wine and liquors, 111,466 p.; salt-meat and provisions, 227,274 p.; various clothing, 4825 p.; silks, 47,872; linen, 1,529,610 p.; furniture, crystals, metals, 29,000 p.; paper, 20,497 p.; wrought iron, 99,581 p.; sugar, 3,207,792 arrobas, or 3,962,709 p.; coffee, 370,229 arrobas, or 847,729 p.; wax, 22,363 arrobas, or 169,683 p.; dressed skins, 19,978 p.

YEAR 1823.

		PIASTERS.
A. IMPORTATION		13,698,735
By Spanish ships	3,562,227 p.	
By foreign ships	10,136,508	
B. EXPORTATION		12,329,169
By Spanish ships	3,550,312 p.	
By foreign ships	8,778,857	

Number of ships which entered the Havannah, 1125, carrying 167,578 tons; quitted the port, 1000, carrying 151,161 tons.

The native productions exported and registered have been estimated in this state of commerce, at

95,884	cases of white sugar.
204,327	yellow ditto.
672,007	arrobas of coffee, first quality.
223,917	second quality.
15,692	arrobas of wax.
30,145	bocois of molasses.
13,879	arrobas of tobacco *en rama.*
71,108	pounds of tobacco *torcido.*
26,610	pieces of leather of the island of Cuba.
3,368	garafons of bees' honey.

Gold and silver imported in specie, 1,179,034 piasters; exported, 1,404,584 piasters.

Among the merchandize and articles *imported*: ready-made clothes, 213,236 p.; cloth and flax, 2,071,083 p.; silk, 459,869 p.; cotton, muslins, &c., 1,021,827 p.; woollen cloth, 163,962 p.; salt-meat, rice, and other provisions, and spices, 3,269,901 piasters (among which were, 431,464 arr. of tasajo, value, 701,129 p.; 309,601 arrobas of rice, value, 348,301 p.; and 89,947 barrels of tallow, value, 259,941 p.); flour, 74,119 barrels, or 889,428 p.; wine and liquors, 1,119,437 p.; wrought iron, 288,697 p.; metals, furniture, crystals, and porcelain, 464,328 p.; paper, 35,186 reams, or 158,337 p.; Castille soap, 53,441 arrobas, or 213,764 p.; tallow (sebo labrado), 42,512 arrobas, or 170,050 p.; planks and other wood (timber) already worked, 353,765 p.

Among the *exported* objects, we shall distinguish, besides the productions of the countries indicated above; linen and flax, 29,526 p.; cottons, 69,049 p.; silk, 11,316 p.; woollen stuffs, 9633 p.; furniture, crystals, metal, 8046 p.; wrought iron, 63,149 p.; planks and wood (timber) worked, 23,433 p.; paper, 5527 reams, or 22,288 p.; wine and liquors, 49,286 p.; salt-meat, provisions, spices, 86,882 p.; paper, 15,322 reams, or 27,772 p.

This is the most exact information I could obtain respecting the entrance and departure of vessels in the port of the Havannah. From 1799 to 1805, the number of ships that entered, mean year, was 905, including in ships of war.

1799	883
1800	784
1801	1015
1802	845
1803	1020

The exportation of sugar was then estimated at 40,000 tons. The total of the ships that entered from 1815 to 1819, mean year, was 1192, of which 226 were Spanish, and 966 foreign. In 1820, there entered, 1305, of which 288 were

Spanish; departed, 1230, of which 919 were foreign. In the following years the merchant-vessels only have been computed:

	entered.	*departed.*	
1821.........	1268	1168.	Of these 1268 only 258 were Spanish. There entered besides 95 ships of war, of which 53 were Spanish.
1821.........	1182	1118.	Of 1182, 843 were foreign; there entered besides 141 ships of war, of which 72 were Spanish.
1823........	1168	1144.	Of these 1168 (167,578 tons), there were 274 Spanish, and 708 of the United States; besides 149 ships of war, of which 61 were Spanish, 54 of the United States, and 34 English and French.
1824.........	1086	1088.	Among these 1086, 890 foreign ships were counted. There entered besides at the Havannah 129 ships of war, of which 59 were Spanish.

EXPORTATION* OF THE PRODUCTIONS OF THE ISLAND OF CUBA BY THE PORT OF THE HAVANNAH, FROM 1815 to 1819.

YEARS.	CASES OF REFINED SUGAR (at 184 kil.).	PIPES OF BRANDY OF SUGAR-CANE.	BOCOYES OF MOLASSES.	ARROBAS OF COFFEE (at 11$^{\text{kil}}$,5).	ARROBAS OF WAX (at 11$^{\text{kil}}$,5).	SKINS AND LEATHER.	VALUE ACCORDING TO THE MEAN PRICE IN PIASTERS.
1815	214,111	3000	17,874	918,263	23,398	60,000	11,955,705
1816	200,487	1860	26,793	370,229	22,365	80,000	10,171,872
1817	217,076	.....	30,759	709,351	20,076	60,000	10,691,219
1818	207,378	3219	34,994	779,618	24,156	60,000	21,628,248
1819	192,743	2830	30,845	642,716	19,373	60,000	10,776,997
Total of five years....	1,031,795	10,909	141,265	3,420,177	109,368	320,000	56,224,041
Mean year	206,359	2182	28,253	684,035	22,233	64,000	11,244,808

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* In this table of the *registered* productions, during five

In comparing, in the tables of commerce of the Havannah, the great value of the merchandize imported, with the little value of the merchandize re-exported, we are surprised that the interior consumption of a country should be so considerable, which contains but 325,000 whites and 130,000 free men of colour *. We find, in estimating the different articles, according to the real current prices: in cotton and linen (*bretañas, platillas, lienzos y hilo*), two and a half to three millions of piasters; in tissues of cotton (*zarazas musulinas*), one million of piasters; in silk (*rasos y generos de seda*), 400,000 piasters; and in cloth and tissues of wool, 220,000 piasters. The wants of the island, in European tissues, *registered* as exported to the port of the Havannah only, exceeded consequently, in these latter years, four millions to

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years, the case of *sugar* has been successively estimated at 16 and 12 *reals*, at 22 and 18 *reals*, at 20 and 16 *reals*, at 22 and 18 *reals*, at 20 and 16 *reals*; the *pipe of brandy*, at 35 piasters; the bocoyo of *molasses*, at 7 *reals*; the quintal of *coffee*, at 15, 15, 12, 16, and 16 piasters; the arroba of *wax*, at 16 piasters.

* It is no doubt by an error in the figures, that in a work which has just appeared (*Aperçu stat. sur l'isle de Cuba*, 1826, p. 231), the island is computed to contain 257,000 free men and 395,000 slaves. The free men of colour are thrown into the same class with the 260,000 slaves, and the whites are diminished 68,000.

four and a half millions of piasters *. To these importations of the Havannah (by lawful means), we must add: metals and furniture, more than half a million of piasters; iron and steel, 380,000 piasters; planks and great timber, 400,000 piasters; Castille soap, 300,000 piasters. With respect to the importation of provisions and liquids for the Havannah, it appears to me to be well worthy the attention of those who would know the real state of those societies which are called *sugar* or *slave colonies*. Such is the composition of those societies established on the most fruitful soil which nature can furnish for the nourishment of man, such the direction of agricultural labors and industry in the West Indies, that, in the happiest climate of the equinoxial region, the population would want subsistence without the freedom and activity of external commerce. I do not speak of the introduction of wines by the port of the Havannah, which amounted (according to the registers of the custom-house), in 1803, to 40,000 *barrels*; in 1823, to 15,000 *pipas* and

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* The importation of Vera Cruz, in tissues *(generos y ropas)*, was, at the beginning of this century, before the revolution of Mexico, 9,200,000 piasters. We must not forget that Mexico has native manufactures of which the produce suffices for the poorer class of the population. *See* above, on the consumption of Mexico and Venezuela compared, vol. vi, p. 231.

17,000 *barrels*, or to the value of 1,200,000 piasters; nor to the introduction of 6000 *barrels* of brandy of Spain and Holland, and 113,000 *barrels* (1,864,000 piasters) of flour. These wines, liquors, and flour, of the value of more than 3,300,000 piasters, belong to the consumption of the opulent part of the nation. The cereals of the United States are become a real article of necessity, in a zone where maize, manioc, and bananas, were long preferred to every other amylaceous food. The development of a luxury altogether European, cannot be complained of amidst the prosperity and increasing civilization of the Havannah; but, placed by the introduction of the flour, wine, and spirituous liquors of Europe, we find, in the year 1816, 1½ millions of piasters; and, in the year 1823, 3½ millions for salt-meat, rice, and dried vegetables. In the latter of these two years, the importation of rice (at the Havannah, according to the registers, and without reckoning the contraband), was 323,000 *arrobas*; and the importation of dried and salt-meat (*tasajo*), so necessary to the nourishment of the slaves, 465,000 *arrobas* *.

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* In the *balanza del comercio de la Havana* (1823), the *official value* for the *tasajo*, is 755,700 piasters; for rice, 363,600 piasters; for pork, 223,000 piasters; for bacon, butter, cheese, 373,000 piasters; for salted cod, which is given to the negroes with the *tasajo*, 100,000 piasters.

The want of subsistence characterizes a part of the tropical regions, where the imprudent activity of the Europeans has inverted the order of nature: it will diminish in proportion as the inhabitants, more enlightened respecting their true interests, and discouraged by the low price of colonial produce, will vary the cultivation, and give free space for all the branches of rural economy. The principles of a narrow policy which preside in the administration of very small islands, real work-shops depending on Europe, and inhabited by men who desert the soil whenever they are sufficiently enriched, cannot be suitable for a country of an extent nearly equal to that of England, covered with populous cities, and where the inhabitants established from father to son, during ages, far from regarding themselves as strangers to the American soil, cherish it as their real country. The population of the island of Cuba, which in fifty years will perhaps exceed a million, may open by its own consumption, an immense field to native industry. If the slave-trade ceases altogether, the slaves will pass by degrees into the class of free men, and society, recomposed, without suffering any of the violent convulsions of civil dissensions, will follow the path which nature has traced for all societies that become numerous and enlightened. The cultivation of the sugar-cane and of coffee will not be abandoned; but it will no longer remain the principal basis of national existence than the cultivation of cochineal for Mexico, of indigo for Guatimala, and of cacao for Venezuela. A free, intelligent, and agricultural population, will progressively succeed a slave population, destitute of foresight and industry. Already the capitals which the commerce of the Havannah has placed within twenty-five years in the hands of cultivators, have began to change the face of the country; and to that power, of which the action is constantly increasing, another will be necessarily joined, inseparable from the progress of industry and national wealth, the development of human intelligence. On these united powers the future destinies of the metropolis of the West Indies depend.

We have seen, that according to the tables of the commerce of the Havannah, the registered exportations are increased, in the productions of the island, by the average of from 1815-1819, to 12,245,000 piasters; and, in later years, to 13 millions of piasters *. If the registered exportations of the Havannah and of Matanzas, in indigenous productions and in foreign merchandize, were re-exported together in 1823, to

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* The estimate I mark here, is not that of the custom-house, but an estimate made according to the current price at the port of the Havannah.

the amount of 15,139,200 piasters *, it may be imagined, without exaggeration, that the whole island might have exported, by lawful and illicit means, in the same year 1823, when the commerce was very active, to the amount of more than 20 to 22 millions of piasters †. These estimates in *specie* naturally vary with the price of merchandize and articles of subsistence. Before Jamaica enjoyed a free commerce, in 1820, the exportations were 5,400,000 pounds sterling. It is generally believed, that Spain draws annually from forty to fifty thousand cases of sugar from the Havannah. (The statement in 1823, was 100,766 *caxas;* in 1825, only 47,547.) The United States ‡, according to the tonnage, make more than the half of the trade of the island of Cuba, and according to the value of the exports, more than a third. We have estimated the total importation of the island at more than 22 to 24 millions of piasters, comprehending the contraband. The value of the merchandize and productions coming from the United States only, by vessels of 106,000 tons *, was 4,270,600 dollars, in 1822. The importations of Jamaica amounted in 1820, according to Mr. Stewart, in value of English manufactures, to two millions of pounds sterling.

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* In the valuable work which has appeared with the title of *Commerce du dix-neuvième siècle,* tom. i, p. 259, the exportation of the Havannah, in 1823, is estimated at less than two millions of piasters; but this estimate is founded on an error of figures. The sugar registered was 300,211 *caxas,* or 120,084,400 Spanish pounds, and not six millions of pounds; the exportation of coffee was 22,398,100 Spanish pounds, and not three millions of pounds. (*See* above, p. 163 and 209.)

† The exportations of the French port of Saint Domingo were, in 1788, 67 millions of francs in sugar, 75 millions of francs in coffee, and 15 millions of francs in cotton; altogether 51,400,000 piasters.

‡ From official documents, the total importations of the United States, in 1820, amounted to 62,586,724 dollars, of which Great Britain and Ireland furnished 29 millions; the

The importation of flour, registered † at the port of the Havannah:

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island of Cuba, 6,584,000; Hayti, 2,246,000; France, 5,909,000 dollars.

* *Aperçu statistique de l'isle de Cuba,* 1826 (Tab. B). M. Huber has added to the translation of *Letters from the Havannah,* much important information on the commerce and the system of imports of the island of Cuba. The importation of 4,270,600 dollars may be regarded as very considerable; for, in 1824, that of Great Britain to Mexico, Colombia, Buenos Ayres, Chili, and Peru, did not amount altogether to more than 2,377,110 pounds sterling. (*An Account of the United Prov. of Rio de la Plata,* 1825, p. 172.)

† The United States exported, in the year 1820, to the amount of 9,075,000 dollars of flour of wheat and maize. The exportation of flour undergoes extraordinary fluctuations. In 1803, it was 1,311,853 barrels; in 1817, 1,479,198; in 1823, 756,702.

1797	62,727 *barrels* (at 7½ *arrobas*, or 84 kilog.).
1798	58,474
1799	59,953
1800	54,441
1801	64,703
1802	82,045
1803	69,254

The importation registered at the port of the Havannah only, in 1823, by Spanish vessels, was 38,987 barrels; by foreign vessels, 74,119 barrels; total, 113,506 barrels, at the mean price of 16½ piasters (comprehending the duties), 1,864,500 piasters. To the wise administration of the governor Don Luis de las Casas *, we owe the first direct introduction of the flour of the United States into the island of Cuba. Till that period, the flour could not enter *till after it had passed the ports of Europe!* Mr. Robinson † estimates the total introduction of this article in the different parts of the island, by lawful and illicit means, at 120,000 barrels. He adds, what appears to me less certain, "that the island of Cuba, on account of the bad distribution of the labor of the blacks, is so much in want of subsistence, that it could not sustain a *blocus* of five months." The United States imported to the island of Cuba, in 1822,

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* *See above*, p. 111.

† *Mem. on the Mexican Revolution*, vol. ii, p. 330.

144,980 *barrels* (more than twelve millions of kilograms), of which the value, at the Havannah, amounted (with the duties) to 2,391,000 piasters. Notwithstanding the duty of seven piasters on every barrel of flour of the United States that enters the island of Cuba, the flour of the peninsula (that of Santander) cannot sustain the competition. This competition began with the happiest auspices for Mexico: during my stay at Vera Cruz, Mexican flour was exported from that port to the value of 300,000 piasters. That quantity augmented, according to Mr. Pitkins, in 1809, to 27,000 *barrels*, or 2,268,000 kilograms. The political troubles of Mexico have entirely interrupted the commerce of cereals between two countries, both placed within the torrid zone, but at a difference of height above the level of the sea, which has a powerful influence on the climate and on cultivation.

The registered importation of liquids at the Havannah, was:

1797......	12,547 *barrels of wine.*	2300 *barrels of brandy.*
1798......	12,118.................	2412
1799......	32,073.................	2780
1800......	20,899.................	5592
1801......	25,921.................	3210
1802......	45,676.................	3615
1803......	39,130.................	3553

To complete what has been said of external commerce, let us hear the author of a memoir whom I have often mentioned, and who states the real situation of the island. "At the Havannah, the effects of the accumulation of wealth begin to be felt; the price of provisions has been doubled in a small number of years. Labor is so dear, that a *bozal* negro, recently brought from the coast of Africa, gains by the work of his hands (without having learnt any trade), from four to five reals (two francs thirteen sols to three francs five sols) a day. The negroes who follow a mechanical trade, however common, gain from five to six francs. The patrician families remain fixed to the soil: a man who has enriched himself, does not return to Europe and take his capital. Some families are so opulent, that Don Matheo de Pedroso, who died lately, left in landed property above two millions of piasters. Several commercial houses of the Havannah purchase, annually, from ten to twelve thousand cases of sugar, for which they pay at the rate of 350,000 or 420,000 piasters. The affairs which are transacted annually in this place, amount to more than twenty millions of piasters." (*De la situacion presente de Cuba,* manuscript.) Such was the state of the public fortune at the end of 1800. Twenty-five years of increasing prosperity have elapsed since that period, and the population of the island is nearly doubled. The exportation of registered sugar had not, in any year, before 1800, attained the extent of 170,000 cases (31,280,000 kilograms); in these latter times * it has constantly surpassed 200,000 cases, and even attained 250,000 and 300,000 cases (forty-six to fifty-five millions of kilograms). A new branch of industry has sprung up, that of plantations of the coffee-tree, which furnishes an exportation of the value of three millions and a

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* Since the court of Madrid has taken the resolution to open several ports in the western part of the island to Spanish and foreign trade, the exportation of sugar registered at the custom-house of the Havannah, should no longer be considered as an exact measure of agricultural prosperity. The port of Mariel, so useful to the planters of the district of Guanajay, had already received its *habilitacion* (the technical term of the commercial Spanish legation) by the *royal cèdule* of October 20th, 1817; but it is within five or six years only that the exportation of Mariel has had a sensible influence on that of the Havannah. The government has alike extended this franchise to other ports, for instance to Baracoa (13 December, 1816), San Fernando de Nuevitas in the Estero of Bagà and the Guiros (5th April, 1819), Bahia de Guantanamo (13th August, 1819), and from San Juan de los Remedios, which has been considered the port of the district of Villa Clara (23d September, 1819). La Bahia de Jagua, where Don Luis de Clouet has begun an agricultural and commercial establishment, by fixing on that spot the ancient planters of Louisiana and other white and free men, is not yet *habilitée*. (Memorias de la Soc. econ. de la Habana, No. 34, p. 287, 293, 297, 300, and 303.)

half of piasters; industry, guided by a greater mass of knowledge, has been better directed; the system of taxation that weighed on national industry and exterior commerce, has been made lighter since 1791, and been improved by successive changes. Whenever the mother country, mistaking its own interests, attempted to make a retrograde step, courageous voices have arisen not only among the *Havaneros*, but often among the Spanish administrators, in defence of the cause of the freedom of American commerce. A new channel has recently been opened for capital, by the enlightened zeal and patriotic views of the intendant Don Claudio Martinez de Pinillos. The commerce of entrepôt has been granted to the Havannah, on the most advantageous conditions *.

The difficult and expensive interior communications of the island, render the productions dearer at the ports, notwithstanding the small distance between the northern and southern coast. A project of canalization, which unites the double advantage of connecting the Havannah and Batabano by a navigable line, and diminishing the dearness of transport of the native productions, merits here a special mention. The idea of the Canal of Guines * had been conceived for more than half a century, with the view of furnishing timber at a more moderate price to the carpenters of the arsenal of the Havannah. In 1796, the Count de Jaruco y Mopox, an enterprising man, who had acquired great influence by his connection with the Prince of Peace, undertook to revive this project. The survey was made, in 1798, by two very able engineers, Don Francisco and Don Felix Lemaur. These officers ascertained that the canal in its whole development, would be nineteen leagues long (5000 varas or 4150 meters), that the point of partition would be at the *Taverna del Rey*, and that it would require nineteen locks towards the north, and twenty-one towards the south. There are only eight and a half marine leagues † from the Havannah to Batabano. The canal of Guines would, even as a *canal of small navigation*, be of great use for the transport of the agricultural productions by steam-boats ‡, because it would take its course near the best cultivated lands. The roads are no where worse in the rainy season than in this part of the island, where the soil is of friable limestone, little fitted for the construction of solid roads. The transport of sugar from Guines to the Havannah, a distance of twelve leagues, now costs a piaster per quintal. Besides the advantage of facilitating the interior communications, the canal would also give great importance to the *surgidero* of Batabano, into which small vessels loaded with salt provisions (*tasajo*) from Venezuela, would enter without being obliged to double the cape Saint Antonio. In the bad season, and in time of war, when corsairs are met with between the cape Catoche, Tortugas, and Mariel, the passage from the main land to the island of Cuba, would be abridged by entering, not at the Havannah, but some port of the southern coast. The construction of the canal de Guines, was estimated, in 1796, at one million or 1,200,000 piasters: it is now thought that the expence would amount to more than one million and a half. The productions which might annually pass the canal have been estimated at 75,000

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* *Acuerdos sobre arreglo de derechos y establecimiento de Almacènes de Deposito.* (*See* Suplemento al Diario del Gobierno constitucional de la Habana del 15 de Octubre 1822.) Without the happy *franchise of the port of the Havannah,* Jamaica would have become the centre of all the mercantile operations with the neighbouring continent.

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* The survey gave, in feet of Burgos: from Cerro near the bridge of Zanja, 106,2; Taverna del Rey, 329,3; Pueblo del Rincon, 295,3; Laguna de Zaldivar, when it is full, 237,3; Quibican, 166,1; Batabano, village, 21,3.

† *See* above, p. 43.

‡ Steam-boats are already established along the coast

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from the Havannah to Matanzas, and less regularly from the Havannah to Mariel. The government granted to Don Juan O-Farrill (March 24th, 1819), a privilege on the *barcos de vapor*.

cases of sugar, 25,000 *arrobas* of coffee, and 8000 *bocoyes* of molasses and rum. According to the first project, that of 1796, it was intended to link the canal with the small river of Guines, to be brought from the Ingenio de la Holanda towards Quibican, three leagues south of Bejucal and Santa Rosa *. This idea is now relinquished, the Rio de los Guines losing its waters towards the east in the irrigation of the savannahs of Hato de Guanamon. Instead of leading the canal on the east of the Barrio del Cerro, and on the south of the fort of Atarès, in the bay of the Havannah, it was proposed at first to make use of the bed of the Chorrera or Rio Armendaris, from Calabazal to the Husillo, and then of the Zanja Real, not only to convey the boats to the centre of the *arrabales* and of the city of the Havannah, but also to furnish water to the fountains, which want to be supplied during three months of the year. I visited several times, with MM. Lemaur, the plains by which this line of navigation is meant to pass. The utility of the project is incontestible, if in the time of great drought a sufficient quantity of water can be brought to the *point of partition.*

At the Havannah, as in every place where commerce and the wealth it produces increase rapidly, complaints are heard of the prejudicial influence of this increase on *ancient manners*. We cannot here stop to compare the first state of the island of Cuba, covered with pasturage, before the taking of the capital by the English, and its present state, since it has become the metropolis of the West Indies; nor to put in the balance the candor and simplicity of manners of an infant society, against the manners that belong to the development of an advanced civilization. The spirit of commerce, leading to the love of wealth, no doubt brings nations to depreciate what money cannot obtain. But the state of human things is happily such, that what is most desirable, most noble, most free in man, is owing only to the inspirations of the soul, to the extent and amelioration of its intelectual faculties. Were the thirst of riches to take absolute possession of every class of society, it would infallibly produce the evil complained of by those who see with regret what they call the preponderance of the industrious system; but the increase of commerce, in multiplying the connections between nations, by opening an immense sphere to the activity of the mind, by pouring capitals into agriculture, and creating new wants by the refinements of luxury, affords the remedy against the dangers which appear to menace. In this extreme complication of causes and effects, time is required to establish the equilibrium between the different classes of society. Civilization, the progress of knowledge, the development of general intelligence, cannot at any given period be measured by the *tonnage*, the value of the exportation, or the improvement of the arts of industry. Natives, like individuals, must not be judged by one station of their life. They accomplish their destinies in passing through the whole scale of a civilization appropriated to their national character, and their physical situation.

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* Official pieces of the *Commision para el fomento de la Isla de Cuba*, 1799, and manuscript notes of M. Bauduy.

FINANCES.—The increase of the agricultural prosperity of the island of Cuba, and the influence of the accumulation of wealth on the value of importations, has raised the public revenue in these latter years, to four millions and a half, perhaps five millions of piasters. The custom-house of the Havannah, which before 1794, yielded less than 600,000 piasters, and from 1797 to 1800, mean year, 1,900,000 piasters, pours into the treasury, since the declaration of free trade, a revenue *(importe liquido)* of more than 3,100,000 piasters *. As the colonial government permits the greatest publicity in all that regards the finances of the island of Cuba, we may ascertain from the *budjets*, the *Cajas matrices de la Administracion general de Rentas* of the town and jurisdiction of the Havannah, that, in the years 1820-1825, the public revenue, as far as it depends on that administration, has fluctuated between 3,200,000 and 3,400,000 piasters. If we add to that sum on one side, 800,000 of different branches of revenue* (*directa entrada*) which the *Tesoreria general* collects, and on the other side, the product of the custom-house of Trinidad, Matanzas, Baracoa, and Santiago de Cuba, which before 1819, amounted to more than 600,000 piasters, we may conceive that the estimate of five millions of piasters, or twenty-five millions of francs for the whole island †, is far from being exaggerated. Very simple comparisons prove how considerable this product is, rela-

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* The custom-house of Port-au-Prince, at Hayti, produced in 1825, the sum of 1,655,764 piasters; that of Buenos Ayres, from 1819 to 1821, mean year, 1,655,000

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piasters. *See Centinela de La Plata* (September 1822), No. 8. *Argos de Buenos Ayres*, No. 85.

* Lottery, *renta decimal*, &c.

† The deputies of the island of Cuba declared to the Cortes of Spain (in May, 1821), that the sum total of contributions " in the province of the Havannah " solely, amounted to five millions of piasters. (*Reclamacion contra la ley de aranceles*, p. 7, No. 6.) In 1818 and 1819, the total receipt of the *general Treasury* was 4,367,000 and 4,105,000 piasters; the expence, 3,687,000 and 3,848,000.

tively to the actual state of the colony. The island of Cuba yet contains but one-forty-second of the population of France; and the half of its inhabitants, being in the most cruel indigence, consume but little. Its revenue is nearly equal to that of the Republic of Columbia *, and is superior to the revenue of all the custom-houses of the United States † before the year 1795, when that confederation had 4,500,000 inhabitants, while the island of Cuba had only 715,000. The principal source of the public revenue of this fine colony is the custom-house, which alone produces above three-fifths, and amply suffices for all the wants of the internal administration and military defence. If, in these latter years, the expence of the general treasury of the Havannah amounted to more than four millions of piasters, this increase of expence is solely owing to the obstinate struggle which the mother country has sustained against its freed colonies. Two millions of piasters were employed to pay the land and sea forces, which poured back from the American continent, by the Havannah, on their way to the peninsula. As long as Spain, forgetful of its

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* *See* vol. vi, p. 301. "In 1530, *esta Isla rento* 6000 *pesos de oro.*" *Herera*, vol. iii, p. 134.

† The custom-houses of the United States, which yielded in 1801 to 1808, sixteen millions of dollars, produced in 1815 but 7,282,000. *Morse, Modern Geogr.*, p. 638.

real interests, refuses to recognize the independence of the New Republics, the island of Cuba, menaced by Columbia and the Mexican Confederation, must support a military force for its external defence, that ruins the colonial finances. The Spanish marine, stationed in the port of the Havannah, generally costs above 650,000 piasters. The land forces require nearly one million and a half of piasters. Such a state of things cannot last indefinitely, if the Peninsula does not relieve the burden that weighs upon the colony.

From 1789 to 1797, the produce of the custom-house at the Havannah, mean year, never rose to more than 700,000 piasters; for the royal taxes *(rentas reales)* poured into the treasury were :

1789	470,302 piasters.
1790	642,720
1791	520,202
1792	849,904
1793	635,098
1794	642,320
1795	643,583
1796	784,689

From 1797 to 1800, the royal and municipal taxes, raised at the Havannah, were 7,634,126 piasters; or, mean year, 1,908,000 piasters :

1797	1,257,017 piasters.
1798	1,822,348
1799	2,305,080
1800	2,249,680
1801	2,170,970
1802	2,400,932
1803	1,637,465

The custom-house of the Havannah has produced:

1808	1,178,974 piasters.
1809	1,913,605
1810	1,292,619
1811	1,469,137
1814	1,855,117

The diminution of the custom-house revenue in 1808, was attributed to the *embargo* put upon American vessels*; but, in 1809, the Court permitted the free entrance of foreign neutral ships†.

From 1815 to 1819, the royal taxes were, in the port of the Havannah, 11,575,460 piasters; the municipal taxes, 6,709,347 piasters; total 18,284,807 piasters; or, mean year, 3,657,000 p., of which the municipal taxes formed $\frac{36}{100}$.

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* *Patr. Amer.*, vol. ii, p. 305.

† *Reclam. contra los Aranc.*, p. 8.

YEARS.	NUMBER OF VESSELS WHICH HAVE GONE IN AND OUT.	DERECHOS REALS.	MUNICIPAL DERECHOS.
1815	2402	1,851,607 p.	804,693 p.
1816	2252	2,233,203	971,056
1817	2438	2,291,243	1,429,052
1818	2322	2,381,658	1,723,008
1819	2365	2,817,749	1,781,530

The public revenue of the *Administracion general de Rentas* of the jurisdiction of the Havannah, amounted in

1820 to........................	3,631,273 piasters.
1821	3,277,639
1822................	3,378,228

The royal and municipal taxes of importation at the custom-house of the Havannah, in 1823, were 2,734,563 piasters. The state of the public revenue of the *Administracion general de Rentas* of the jurisdiction of the Havannah in 1824, was as follows:

I. Taxes of importation		1,818,896 piasters.
Almojarifazgo.....	1,817,950 p.	
Alcabala..........	802	
Armada...........	144	
II. Taxes of exportation		326,816
III. Coasting-vessels and other different branches (salt, 27,781 p.; tax of depôt, 154,924 p.; *media anata, armadilla*, &c.); total.........		188,415
IV. *Rentas de tierra* (tax on the slaves, 73,109 p.; sale of lands, or *fincas*, 215,092 p.; subaltern administrations, 154,840 p.; shops, or *pulperias*, 19,714 p., &c.); total..		473,686
V. Auxiliary branches of the *Tresoria del Ejercito (Almirantazgo, Registros estrangeros*, &c.................		136,923
VI. *Consulado, Cuartillo adicional del muelle, Vestuario de milicias*, &c...		80,564
Total revenue in 1824		3,025,300 piasters.

The revenue of the town and jurisdiction of the Havannah, in 1825, was 3,350,300 piasters.

These partial statements shew that, from 1789 to 1824, the public revenue has been increased sevenfold; this increase becomes still more sensible when we observe the product of ten administrations, or *Tresorerias subalternas interiores* (Matanzas, Villa Clara, Remedios, Trinidad, Santo Espiritu, Puerto Principe, Holguin, Bayamo, Santiago de Cuba, and Baracoa).

M. Barrutia * has published an interesting table on the provincial administrations, containing a period of eighty-three years, from 1735 to 1818. The total product of ten cases rose progressively from nine hundred piasters to six hundred thousand.

1735	898 piasters.
1736	860
1737	902
1738	1,794
1739	4,747
Mean year	1,840
1775	123,246 piasters.
1776	114,366
1777	128,303
1778	158,624
1779	146,007
Mean year	133,315
1814	317,699 piasters.
1815	398,676
1816	511,510
1817	524,442
1818	618,036
Mean year	474,072

The total of the eighty-three years was

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* *Mem. de la Real Soc. Economica de la Habana,* No. 31, p. 220.

13,098,000 piasters, of which Santiago de Cuba gave 4,390,000 piasters; Puerto Principe, 2,223,000 p., and Matanzas, 1,450,788 piasters.

According to the state of the *Cajas matrices*, the public revenue, in 1822, was in the province of the Havannah alone, 4,311,862 p.; which arose from the custom-house, (3,127,918 p.) the *los ramos de directa entrada*, as lottery, tithes, &c. (601,898 p.) and anticipations on the charges of the *Consulado* and the *Deposito* (581,978 p.). The expence in the same year, for the island of Cuba, was 2,732,738 p., and for the succour destined to maintain the struggle with the continental colonies declared independent, 1,362,029 p. In the first class of expence we find 1,355,798 p. for the subsistence of the land forces charged with the defence of the Havannah and the neighbouring places; and 648,908 p. for the royal navy stationed in the port of the Havannah. In the second class of expence foreign to the local administration, we find: 1,115,672 p. for the pay of 4234 soldiers, who, after having evacuated Mexico, Columbia, and other parts of the continent formerly Spanish, passed by the Havannah to return to Spain; 164,000 p., expence of the defence of the castle of Saint Juan d'Uloa. The intendant of the island of Cuba, Don Claudio Martinez de Pinillos, in one of the notes that accompany *l'Estado de las Cajas matrices* of 1822, adds the following consideration: "If, to the extraordinary expenditure of 1,362,022 piasters relative to the general interests of the Spanish monarchy, we add, on the one hand, the greater part of the 648,908 piasters furnished for the subsistence of the royal navy of which the service is not limited to the defence of the Havannah, and, on the other, the expence occasioned by the passage of maritime couriers and ships of war, we shall find that 2,010,930 piasters, nearly the half of the public revenue, is absorbed by expences which have no direct relation with the interior administration of the island." How much the cultivation and prosperity of this country will one day gain, when, in a state of internal tranquillity, more than one million and a half of piasters may be annually employed in works of public utility, but above all in the ransom of laborious slaves, such as is already practised according to the wise and humane legislation of the Republic of Columbia!

I saw, by the documents which I collected in the archives of the Vice-royalty of Mexico, that the pecuniary succour, which at the beginning at the 19th century was annually sent to the Havannah by the treasury of New Spain, was:

		PIASTERS.
NAVY...	a) for the squadron, the docks, and all the wants of the royal navy, according to the cedule of 16th Jan. 1790...	700,000
	b) for the maritime establishment of the coast of the Mosquitos	40,000
ARMY..	a) for the land service at the Havannah, according to the cedules of May 18th, 1784, February 4th, 1788, and November 1st, 1790	290,000
	b) for the land service at Santiago de Cuba	146,000
FORTIFICATIONS,	according to the royal cedule of February 4th, 1788	150,000
TOBACCO,	that is, the purchase of leaves and the fabrication of tobacco destined for Seville, according to the cedules of August 2d, 1744, and December 22d, 1767 ..	500,000
	Total	1,826,000

To this may be added a sum of *nine millions of francs*, which now fall to the charge of the Havannah, 557,000 piasters which Mexico paid to aid the treasury of Louisiana; 151,000 p. for Florida, and 377,000 p. for the isle of Portorico.

I here terminate the *Political Essay on the Island of Cuba*, in which I have traced the state of that important possession of Spain, such as it now is. As the historian of America, I wished to throw light on facts, and give precision to ideas, by the aid of comparisons and statistical tables. That minute investigation of facts seems necessary at a moment when, on one side, the enthusiasm that leads to benevolent credulity; and on the other, the passionate animosities that menace the security of the new republics, have given rise to the most vague and erroneous statements. In conformity to the plan of my work, I have abstained from all reasoning on future chances, and on the probability of the changes which external politics may produce in the situation of the West Indies; I have solely examined what regards the organization of human societies; the unequal partition of rights and of the enjoyments of life; the threatening dangers which the wisdom of the legislator and the moderation of freemen may ward off, whatever be the form of the government. It belongs to the traveller who has himself seen what torments or degrades human nature, to make the complaint of the unfortunate reach the ear of those by whom they can be relieved. I observed the condition of the blacks in countries where the laws, the religion, and the national habits tend to soften their fate; yet I preserved, on quitting America, the same horror of slavery which I had felt in Europe. It is in vain that writers of ability, in order to veil barbarous institutions by ingenious fictions of language, have invented the terms of *negro peasants of the*

West Indies, *black vassalage*, and *patriarchal protection:* it is to profane the noble qualities of the mind and the imagination, to exculpate by illusory comparisons, or captious sophisms, excesses that afflict humanity, and for which they prepare violent commotions. Do they think they have acquired the right of dispensing with commiseration, by comparing * the state of the blacks with that of the serfs of the middle ages, and with that state of oppression under which some classes still groan in the north and east of Europe? Those comparisons, those artifices of language, that disdainful impatience with which even a hope of the gradual abolition of slavery is repulsed as chimerical, are useless arms in the times in which we live. The great revolutions which the continent of America and the Archipelago of the West Indies have undergone since the commencement of the nineneenth century, have acted upon the ideas and the public reason, even in countries where slavery exists and begins to be modified. Many wise men, deeply interested in the tranquillity of the *sugar and slave islands*, feel that by a liberal agreement of the proprietors, and by measures taken by those who know the localities, they might emerge from a state of crisis and uneasiness, of which indolence and obstinacy will augment the danger. I will endeavour, at the end of this chapter, to give some indications of the possibility of those measures, and to prove, by extracts taken from official pieces, that at the Havannah, long before external politics could have had the least influence on their opinions, the local authorities the most attached to the mother-country, have from time to time displayed dispositions favorable to the amelioration of the state of the blacks.

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* These comparisons do not tranquillize those who, secret partizans of the slave-trade, seek to forget the calamities of the black race, and in some resist every emotion they might awaken. The permanent state of a caste founded on barbarous laws and institutions, is often confounded with the excesses of a power exerted momentarily on some individuals. Thus Mr. Bolingbroke, who lived seven years at Demarara, and who visited the West India islands, does not hesitate to repeat that " on board an English ship of war, whipping is more frequent than in the plantations of the English colonies." He adds, " that in general the negroes are little whipped, but that very reasonable means of correction have been imagined, such as making them eat boiling soup, strongly peppered, or drink, with a very small spoon, a solution of Glauber-salt." The slave-trade appears to him an universal benefit; and he is persuaded that if the negroes were permitted to return to the coast of Africa, who have enjoyed during twenty years all the conveniences of the life of slaves at Demarara, they would make a fine recruiting; and bring whole nations to the English possessions. (*Voyage to Demarara,* 1807, p. 107, 108, 116, 136.) Here is the profession of faith of a planter, firm and frank; yet Mr. Bolingbroke, as several passages of his book prove, is a moderate man, full of benevolent intentions towards the slaves.

Slavery is no doubt the greatest of all the evils that afflict humanity, whether we consider the slave torn from his family in his native country, and thrown into the hold of a slave-ship *, or as making part of a flock of black men, parked on the soil of the West Indies; but for individuals there are degrees of suffering and privation. What a distance between a slave who serves in the house of a rich man at the Havannah or Kingston, or who works for himself, giving his master but a daily retribution, and a slave attached to a sugar-estate! The threats which are used to correct an obstinate negro, develope this scale of human privations. The *calessero* is menaced with the *cafetal;* and the slave who works at the *cafetal* is menaced with the *sugar fabric.* The black who has a wife, who inhabits a separate hut, who, affectionate as are the Africans for the most part, finds, after his labor, that some care is taken of him amidst his indigent family, has a fate not to be compared with that of the insulated slave lost in the mass. This diversity of condition escapes those who have not had the spectacle of the West Indies before their eyes. The progressive amelioration of the state even of the captive caste, explains that in the island of Cuba the luxury of the masters, and the possibility of gain by their work, have drawn* more than eighty thousand slaves towards the towns; and how the manumission of them, favored by the wisdom of the laws, is become so active as to have produced, fixing on the present period, more than 130,000 free men of colour. It is in discussing the individual position of each class, in recompensing, by the decreasing scale of privations, the intelligence, the love of labour, and the domestic virtues, that the colonial administration will find the means of ameliorating the fate of the blacks. Philanthropy does not consist in giving "a little more salt-fish, and some strokes of the whip less;" a real amelioration of the captive caste ought to extend over the whole moral and physical position of man.

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* "If the slaves are whipped," said one of the witnesses, at the *parliamentary inquest* of 1789, "to make them dance on the deck of a slave-ship, if they are forced to sing in chorus; *messe, messe, mackerida* (how gaily we live among the whites), this only proves the care we take of the health of those men." This delicate attention reminds me that in the description of an *auto-da-fe* in my possession, a boast is made of the prodigality with which refreshments are distributed to the condemned, and of the stair-case which the inquisitors have had erected in the interior of the pile for the accommodation of the *relaxados.*

The impulse might have been given by those European governments which have the sentiment of human dignity, and who know that whatever is unjust bears with it a germ of destruction; but this impulse, it is afflicting to add, will be powerless, if the union of the proprietors, if the colonial assemblies or *legislatures*, fail to adopt the same views, and to act by a well concerted plan, of which the ultimate aim is the cessation of slavery in the West Indies. Till then, it will be in vain to register the strokes of the whip, diminish the number that can be inflicted at any one time, require the presence of witnesses, and name protectors of the slaves; all these regulations, dictated by the most benevolent intentions, are easily eluded: the loneliness of the plantations renders their execution impossible. They suppose a system of domestic inquisition incompatible with what is called in the colonies "the acquired rights." The state of slavery cannot be altogether peaceably ameliorated but by the simultaneous action of free men (white and coloured) who inhabit the West Indies; by colonial assemblies and *legislatures*; by the influence of those who, enjoying a great moral consideration among their countrymen, and acquainted with the localities, know how to vary the means of amelioration according to the manners, the habits, and the position of every island. In preparing this task, which ought to comprehend at the same time, a great part of the archipelago of the West Indies, it is useful to cast a retrospective look on the events by which the freedom of a considerable part of the human race was obtained in Europe in the middle ages. In order to ameliorate without commotion, new institutions must be made to issue from those which the barbarism of centuries has consecrated. It will one day be difficult to believe, that till 1826, there existed no law in the Great Antilles to prevent selling infants, and separating them from their parents, and to prohibit the degrading custom of marking the negroes with a hot iron, merely that the human cattle might be more easily recognised. Enact laws to take away the possibility of a barbarous outrage; fix, in every sugar estate, the relation between the least number of negresses and that of the cultivating negroes; grant liberty to every slave who has served fifteen years, to every negress who has reared four or five children; set them free on the condition of working a certain number of days for the profit of the plantation; give the slaves a part of the neat produce, to interest them in the increase of agricultural riches *; fix a sum on

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* *See* above, p. 108, 151, 208.

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* General Lafayette, whose name is linked with all that promises to contribute to the liberty of men, and to ameliorate their fate by institutions, had, in the year 1785, conceived the project of purchasing a settlement at Cayenne,

the *budget* of the public expence, destined for the ransom of slaves and the amelioration of their fate;—such are the most urgent objects of colonial legislation.

The *conquest*, on the continent of Spanish America, and the slave-trade in the West Indies, Brazil, and in the southern parts of the United States, have united the most heterogeneous elements of population. Now, this strange mixture of Indians, whites, negroes, métis, mulattoes, and *zambos*, appears accompanied with all the perils which the heat and disorder of the passions can engender, at such critical periods, when society, shaken to its very foundations, begins a new era. The odious principle of the *colonial system*, that of security, founded on the hostility of castes, and prepared during ages, then bursts forth with violence. Fortunately the number of blacks was so inconsiderable in

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and to divide it among the blacks by whom it was cultivated, and for whom the proprietor renounced for himself and his descendants, all profit whatever. He had interested in this noble enterprise the priests of the Mission of the Holy Spirit, who themselves possessed lands in French Guyana. A letter of the Marshal de Castries, dated 6th June, 1785, proves that the unfortunate Louis XVI, extending his beneficent intentions to the blacks and the free men of colour, had ordered similar trials to be made at the expence of government. M. de Richeprey, charged by M. de Lafayette with the partition of the lands among the blacks, died of the effects of the climate at Cayenne.

the new states of the Spanish continent, that, with the exception of the cruelties exercised in Venezuela, where the royalist party armed their slaves, the struggle between the independents and the soldiers of the mother country was not stained by the vengeance of the captive population. The free men of colour (blacks, mulattoes, and *mestizos*) have warmly espoused the national cause, and the copper-coloured race in its timid distrust, and mysterious passiveness, has remained a stranger to the movements from which it must profit in spite of itself. The Indians, long before the revolution, were poor and free agriculturists; insulated by their language and manners, they lived separated from the whites. If, in contempt of Spanish laws, the cupidity of the *corregidores*, and the tormenting system of the *missionaries*, often shackled their liberty, that state of vexatious oppression was far different from personal slavery like that of the vassallage, the blacks, or of the peasants in the Sclavonian part of Europe. It is the small number of blacks, it is the liberty of the aboriginal race, of which America has preserved more than eight millions and a half without mixture of foreign blood, that characterises the ancient continental possessions of Spain, and renders their moral and political situation entirely different from that of the West Indies, where, by the disproportion between the free men and the slaves, the *principles of the colonial system* could be developed with more energy. In that archipelago, as at Brazil (two portions of America which contain near three millions two hundred thousand slaves), the fear of a reaction among the blacks, and the perils that surround the whites, have been hitherto the most powerful cause of the security of the mother country, and of the maintenance of the Portuguese dynasty. Can this security, from its nature, be of long duration? Does it justify the inaction of governments who neglect to remedy the evil while it is yet time? Of this I doubt. When, under the influence of extraordinary circumstances, alarms are weakened, and countries where the accumulation of slaves has given society the fatal mixture of heterogeneous elements, will be led, perhaps unwillingly, into an exterior struggle, civil dissensions will manifest themselves in all their violence, and the European families, innocent of an order of things which they have not created, will be exposed to the most imminent dangers.

We can never enough praise the wisdom of the legislation in the new republics of Spanish America, which since their birth, has been seriously occupied with the total extinction of slavery. That vast portion of the earth has, in this respect, an immense advantage over the southern part of the United States, where the whites, during the struggle with England, established liberty for their own profit, and where the slave population, to the number of one million six hundred thousand, augments still more rapidly than the white [*]. If, civilization, instead of extending itself, were to change its place; if, after great and deplorable convulsions in Europe, America, between cape Hatteras and the Missouri, became the principal seat of the light of christianity, what a spectacle would that centre of civilization offer, where, in the sanctuary of liberty, we could attend a *sale of negroes after death*, and hear the sobbings of parents who are separated from their children! Let us hope that the generous principles which have so long animated [†] the *legislatures* in the northern parts of the United States, will extend by degrees towards the south, and towards those western regions, where, by the effect of an imprudent and fatal law *, slavery and its iniquities have passed the chain of the Alleghanys and the banks of the Mississipi; let us hope that the force of public opinion, the progress of knowledge, the softening of manners, the legislation of the new continental republics, and the great and happy event of the recognition of Hayti by the French government, will exert either by motives of prudence and fear, or by more noble and disinterested sentiments, a happy influence on the amelioration of the state of the blacks in the rest of the West Indies, in the Carolinas, Guyana, and Brazil.

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[*] Vol. vii, p. 151.

[†] Forty-six years before the declaration of the congress at Vienna, and thirty-eight years before the abolition of the slave-trade, decreed in London and at Washington, in 1769, the chamber of representatives of Massachusetts had declared itself against *the unnatural and unwarrantable custom of enslaving mankind*. (See *Walsh, Appeal to the United States*, 1819, p. 312.) The Spanish writer, Avendaño, is perhaps the first who declaimed forcibly not only against the slave-trade, abhorred even by the Afgangs (*Elphinstone, Journ. to the Cabùl*, p. 245), but against slavery in general, and "all the iniquitous sources of colonial wealth." *Thesaurus, ind.*, tom. i, tit. 9, cap. 2.

In order to slacken progressively the bonds of slavery, the laws against the slave-trade must be most strictly enforced, and punishments of infamy inflicted on those who infringe them; mixed tribunals must be formed, and the right of search exercised with equitable reciprocity. It is melancholy to learn, that by the disdainful and guilty indifference of some of the governments of Europe, the slave-trade, become more cruel because it is more occult, has torn anew from Africa, within ten years, almost the same number of blacks as before 1807; but we must not from this fact conclude the inutility, or, as

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* *Rufus King, Speeches on the Missouri Bill* (New York, 1819). *North American Review,* No. 26, p. 137-168.

the secret partisans of slavery assert, the practical impossibility of these beneficent measures, adopted first by Denmark, the United States, and Great Britain, and successively by all the rest of Europe. What passed since 1807, till the moment when France again entered into possession of her ancient colonies, and what passes in our days in nations of which the governments sincerely desire the abolition of the slave-trade and its abominable practices, proves the falsehood of this conclusion. Besides, is it reasonable to compare numerically the importation of slaves in 1825 and in 1806? With the activity which reigns in every enterprize of industry, what an increase would the importation of negroes have taken in the English West Indies, and the southern provinces of the United States, if the slave-trade, entirely free, had continued to supply new slaves, and had rendered the care of their preservation, and the augmentation of the ancient population superfluous? Can we believe that the English trade would have been limited, as in 1806, to the sale of 53,000 slaves; and that of the United States, to the sale of 15,000? It is pretty well ascertained that the English islands received in the 106 years that preceded 1786, more than 2,130,000 negroes, torn from the coast of Africa. At the period of the French revolution, the slave-trade furnished (according to Mr. Norris) 74,000 slaves annually, of which the English colonies absorbed 38,000, and the French, 20,000. It would be easy to prove that the whole archipelago of the West Indies, which now comprise scarcely 2,400,000 negroes and mulattoes (free and slaves), received from 1670 to 1825, nearly five millions of Africans (*negros bozales*). In these revolting calculations on the consumption of the human species, we have not included the number of unfortunate slaves who have perished in the passage, or been thrown into the sea as damaged merchandize *. Now, by how many thousands must we have augmented the loss, if the two nations who possess the most ardor and intelligence in the development of commerce and industry, the English and the inhabitants of the United States, had continued, from 1807, to take a share of the trade as freely as some other nations of Europe? Sad experience has proved how much the treaties of the 15th July, 1814, and of the 22d January, 1815, by which Spain and Portugal reserved to themselves †

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* Vol. vii, p. 151. *See* also the eloquent speech of the Duke de Broglie (March 28th, 1822), p. 40, 43, 96.

† "Dicen nuestros Indios del Rio Caura cuando se confiesan que ya entienden que es pecado comer carne humana; pero piden que se les permita desacostumbrarse poco a poco:

'the commerce in the blacks" during a certain number of years, have been fatal to humanity.

The local authorities, or rather the rich proprietors, forming the *Ayuntamiento of the Havannah*, the *Consulado*, and the *Patriotic Society*, have on several occasions* displayed dispositions favorable to the amelioration of the fate of the slaves. If the government of the mother country, instead of dreading the least appearance of innovation, had known how to take advantage of those propitious circumstances, and of the ascendancy of some men of abilities over their countrymen, the state of society would have undergone progressive changes, and in our days, the inhabitants of the island of Cuba would enjoy a part of the ameliorations which have been discussed during thirty years. The movements of Saint Domingo, in 1790, and those of Jamaica, in 1794, caused so great an alarm among the *hacendados* of the island of Cuba, that in a *Junta economica*, it was warmly debated what could be tried to preserve the tranquillity of the country. Regulations were

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quieren comer la carne humana una vez al mes, despues cada tres meses, hasta que sin sentirlo pierdan la costumbre." *Cartas de los Rev. Padres Observantes,* No. 7 (manuscript).

* *Representacion al Rey de* 10 *de Julio de* 1799 (manuscript).

made respecting the pursuit of fugitives *, which, till then, had given rise to the most guilty excesses; it was proposed to augment the number of negresses on the sugar estates, to take more care of the education of children, to diminish the introduction of African negroes, to bring white planters from the Canaries, and Indian planters from Mexico, to establish coun-

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* *Reglamento sobre los Negros Cimmarrones de* 26 *de Dec. de* 1796. Before the year 1788, there were many fugitive negroes (*cimarrones*) in the mountains of Jaruco, where they were sometimes *apalancados*, that is, where several of those unfortunate men formed small intrenchments for their common defence, by heaping up trunks of trees. The maroon negroes, born in Africa, or *bozales*, are easily taken; for the greater number, in the vain hope of finding their native land, march day and night towards the east. When taken, they are so extenuated by fatigue and hunger, that they are only saved by giving them, during several days, very small quantities of soup. The creole maroon negroes conceal themselves by day in the woods, and steal provisions during the night. Till 1790, the right of taking the fugitive negroes belonged only to the *Alcade mayor provincial*, an hereditary charge in the family of the Count de Bareto. At present, all the inhabitants can seize the maroons, and the proprietor of the slave pays four piasters per head, besides the food. If the name of the master is not known, the *Consulado* employs the maroon negro in the public works. This man-hunting, which, at Hayti and Jamaica, has given so much fatal celebrity to the dogs of Cuba, was exercised in the most cruel manner before the regulation which I have mentioned above.

try schools in order to soften the manners of the lower class, and to mitigate slavery in an indirect manner. These propositions had not the desired effect. The court opposed every system of transmigration, and the majority of the proprietors, indulging their ancient illusions of security, would not restrain the slave-trade, when the high price of the produce gave a hope of extraordinary profit. It would, however, be unjust not to signalize, in this struggle between private interests and the views of wise policy, the desires and the principles displayed by some inhabitants of the island of Cuba, either in their own name, or in the name of some rich and powerful corporations. "The humanity of our legislation," says M. d'Arango nobly *, in a memoir written in 1796, "grants the slave four rights (*quatro consuelos*), which somewhat soften his pains, and which have always been refused him by a foreign policy. These rights are, the choice of a master less severe †; the faculty of marrying from his own inclination; the possibility of purchasing his liberty * by his labor, and of paying, with an acquired property, for the liberty of his wife and children †. Notwithstanding the wisdom

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* *Informe sobre negros fugitivos* (*de* 9 *de Junio de* 1769), *por Don Francisco de Arango y Pareño, Oidor honorario y syndico del Consulado.*

† The right of *buscar amo.* When a slave has found a new master who will purchase him, he may quit the master of whom he has to complain; such is the sense and spirit of a beneficent law, but often eluded, as are all the laws that protect the slaves. In the hope of enjoying the privilege of

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buscar amo, the blacks often address to the travellers they meet, a question, which in civilized Europe, where a vote or an opinion is sometimes sold, is never made aloud; *quiere Vm. comprarme* (will you buy me)?

* A slave in the Spanish colonies ought, according to the law, to be estimated at the lowest price; this estimation, at the time of my voyage, was according to the localities, from 200 to 380 piasters. We have seen above (vol. vii, p. 151 and 180) that, in 1825, the price of an adult negro, at the island of Cuba, was 450 piasters. In 1788, the French trade furnished a negro for 280 to 300 piasters. (*Page, Treatise on the Political Economy of the Colonies,* vol. ii, p. 149.) A slave, among the Greeks, cost 300 to 600 drachmes (54 to 108 piasters), when the day-labourer was paid one-tenth of a piaster. While the Spanish laws and institutions favor *manumission* in every way, the master, in the other islands, pays the fiscal, for every freed slave, five to seven hundred piasters!

† What a contrast between the humanity of the most ancient Spanish laws concerning slavery, and the traces of barbarity found in every page of the *Black Code,* and in some of the provincial laws of the English islands! The laws of Barbadoes, made in 1686, and those of Bermuda, in 1730, order, that the master who killed his negro in chastising him, could not be pursued, while the master who killed his slave wilfully, must pay ten pounds sterling to the royal treasury. A law of Saint Christophers, of March 11th, 1784, begins by these words; "Whereas some persons have *of late* been guilty of cutting off and depriving slaves of their ears, we order that, whoever shall extirpate an eye, tear out

and mildness of the Spanish legislation, to how many excesses the slave is exposed in the solitude of a plantation or a farm, where a rude *capataz*, armed with a cutlass (*machete*) and a whip, exerts an absolute authority with impunity! The law neither limits the punishment of the slave nor the duration of labor; nor prescribes the quality and the quantity of food *. It permits the slave, it is true, to have recourse to a magistrate, in order that he may enjoin the master to be more equitable; but this recourse is nearly illusory; for there exists another law, according to which every slave may be arrested and sent back to his master who is found without a permission at the distance of a league and a half from the plantation to which he belongs. How can a slave, whipped, exhausted by hunger, and excess of labour, find means to appear before the magis-

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the tongue, or cut off the nose of a slave, shall pay five hundred pounds sterling, and be condemned to six months imprisonment." It is unnecessary to add, that these English laws, which were in force thirty or forty years ago, are abolished and replaced by laws more humane. Why can I not say as much of the legislation of the French islands, where six young slaves, suspected of an intention to escape, were condemned, by a sentence pronounced in 1815, to have *the ham-strings cut!* (*See* above, vol. vii, p. 128.)

* A *royal cedule*, of May 31st, 1789, had attempted to regulate the nourishment and clothing; but that *cedule* was never executed.

trate? and if he did reach him, how would he be defended against a powerful master, who calls upon the hired accomplices of his severities, as witnesses *."

I shall conclude by citing a very remarkable extract from the *Representacion del Ayuntamiento, Consulado y Sociedad patriotica,* dated July 20th, 1811. "In all that relates to the changes to be introduced in the *captive class,* there is much less question of our fears on the diminution of agricultural wealth, than of the security of the whites, so easy to be compromised by imprudent measures. Besides, those who accuse the consulate and the municipality of the Havannah of an obstinate resistance, forget that, in the year 1799, the same authorities proposed fruitlessly, that the government would occupy itself with the state of the blacks in the island of Cuba (*del arreglo de este delicado asunto*). Further, we are far from adopting the maxims which the nations of Europe, which boast of their *civilization,* have regarded as incontrovertible; that, for instance, without slaves there could be no colonies. We declare, on the contrary, that without slaves, and even without blacks, colonies might have existed, and that the whole difference would have been comprised in more or less profit, by the more or less rapid increase of the products. But, if such is our firm persuasion, we ought also to remind your Majesty, that a social organization into which slavery has been introduced as an element, cannot be changed with inconsiderate precipitation. We are far from denying that it was an evil contrary to all moral principles to drag slaves from one continent to another; that it was a political error not to have listened to the complaints made by Ovando, the governor of Hispaniola, of the introduction and accumulation of so many slaves placed near a small number of free men; but, these evils being now inveterate, we ought to avoid rendering our position and that of our slaves worse, by the employment of violent means. What, we ask of your Majesty, is conformable to the wish proclaimed by one of the most ardent protectors of the rights of humanity, by the most determined enemy of slavery; we desire, like him, that the civil laws should deliver us at the same time from abuses and dangers."

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* "Hasta abandono hemos hecho de especies muy favorables que pasan por inconcusas en esas *naciones cultas.* Tal es la de que sin negros esclavos no pudiera haber colonias. Nosotros contra este dictamen decimos que sin esclavitud, y aun sin negros, pudo haber lo que por colonias se entiende, y que la diferencia habria estado en las mayores ganancias ó en los mayores progresos." (*Documentos sobre el trafico y esclavitud de negros,* 1814, p. 78-80.)

On the solution of this problem depends, in the West Indies only, and excluding the republic of Hayti, the security of 875,000 free men (whites and men of colour)*, and the softening the fate of 1,150,000 slaves. We have demonstrated that this can never be obtained by peaceful means, without the concurrence of the local authorities, either *colonial assemblies*, or meetings of proprietors designated by less dreaded names, by the old parent state. The direct influence of the authorities is indispensible; and it is a fatal error to believe "that we may leave it to time to act." Yes, time will act simultaneously on the slaves, on the relations between the islands and the inhabitants of the continent, and on events which cannot be controuled, when they have been waited for in the inaction of apathy. Wherever slavery is long established, the increase of civilization solely has less influence on the treatment of slaves than many are disposed to admit. The civilization of a nation seldom extends to a great number of individuals; and does not attain those, who in the fabrics, are in immediate contact with the blacks. I have known very humane proprietors shrink from the difficulties that arise in the great plantations; they hesitate to disturb the established order, to make

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[*] Namely: 452,000 whites, of which 342,000 are in the two Spanish islands (Cuba and Portoricó), and 423,000 free men of colour, mulattoes, and blacks.

innovations, which, if not simultaneous, not sustained by the legislation, or, which would be a more powerful means, by the general will, would fail in their end, and perhaps aggravate the wretchedness of those whose fate they were meant to soften. These timid considerations stop the good that might be done by men who have the most benevolent intentions, and who deplore the barbarous institutions of which they have received the sad inheritance. Acquainted with the local circumstances, they know, that to produce an essential change in the state of the slaves, to lead them progressively to the enjoyment of liberty, requires a firm will in the local authorities, the concurrence of wealthy and enlightened citizens, and a general plan in which all the chances of disorder, and the means of repression, are calculated. Without this community of actions and efforts, slavery, with its pains and excesses, will maintain itself as it did in ancient Rome *, in

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* The argument drawn from the civilization of Rome and Greece, in favor of slavery, is much in vogue in the West Indies, where sometimes we find it adorned with all the elegance of philological erudition. Thus, in discourses pronounced in 1795, in the *legislative assembly* of Jamaica, it was proved, that from the example of elephants having been employed in the wars of Pyrrhus and Hannibal, it could not be blameable to have brought a hundred dogs and forty hunters from the island of Cuba to hunt the maroon negroes. *Bryan Edwards,* vol. i, p. 570.

the midst of elegance of manners, the boasted progress of knowledge, and all the charm of civilization which its presence condemns, and which it menaces to overwhelm when the time of vengeance arrives. Civilization, or the slow decline of nations, only prepare the mind for future events; but, to produce great changes in the social state, requires a coincidence of events of which the epoch cannot be calculated beforehand. Such is the complication of human destiny, that the same cruelties which stained the conquest of the two Americas, are renewed before our eyes, in times which we believed to be characterized by an immense progress in knowledge, and a general amelioration of manners. The life of one man alone has sufficed to see *terror* in France, the expedition to Saint Domingo*, the political reaction of Naples and Spain; and, I might add, the massacres of Chio, Ipsara, and Missolonghi, deeds of the barbarians of eastern Europe, which the civilized nations of the west and north have not thought it fit to prevent. In slave-countries, where long habit tends to legitimate institutions the most contrary to justice, we must count on the influence of knowledge, intellectual improvement, and the softening of manners, only inasmuch as they accelerate the impulse given by governments, and facilitate the execution of measures once adopted. Without this directing action of governments and of *legislatures*, a peaceable change is not to be hoped for. Above all, the danger becomes imminent when a general inquietude pervades the public mind, and when in the midst of political discussions which agitate neighbouring nations, the faults and duties of government have been discerned; the calm can then only spring from an authority, which in the noble sentiment of its force and its right, knows how to direct events in opening itself the career of ameliorations.

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* *North American Review,* 1821, No. 30, p. 116. The struggles with the slaves who fight for their liberty, are not only dreadful on account of the atrocities to which they give rise on both sides; but they, when that freedom is effected, contribute also to confound all the sentiments of justice and injustice. "Some planters condemn to death all the male population down to the age of six years. They affirm, that the example which those who have not borne arms have witnessed, may become contagious. This want of moderation is the consequence of the long misfortunes of the planters." *Charault, Réflexions sur Saint Domingue,* 1806, p. 16.

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Towards the end of the month of April, M. Bonpland and myself, having terminated the observations we proposed to make at the northern extremity of the torrid zone, were on the point of going to Vera Cruz with the squadron of Admiral Ariztizabal; but false intelligence spread in the public papers about the expedition of Captain Baudin, led us to relinquish the project of crossing Mexico in order to reach the Philippine islands. Several journals, particularly those of the United States, announced that two French sloops, the *Geographe* and the *Naturaliste*, had sailed for cape Horn; that they were to go along the coast of Chili and Peru, and from thence to New Holland. This intelligence threw me into great agitation; all the projects I had formed during my stay at Paris, when I solicited the ministry of the *Directory* to hasten the departure of Captain Baudin, presented themselves anew to my imagination. At the moment of leaving Spain, I had promised to rejoin the expedition wherever I could reach it. When we ardently desire any thing of which the issue may be fatal, we easily persuade ourselves that a sentiment of duty was the sole motive of the resolution we have taken. M. Bonpland, always enterprising, and confiding in our good fortune, resolved instantly to divide our herbals into three portions; and to avoid exposing to the chances of a long navigation what we had collected with so much difficulty on the banks of the Oroonoko, the Atabapo, and the Rio Negro, we sent one collection by the way of England to Germany, another by the way of Cadiz to France, and a third collection remained deposited at the Havannah. We had reason to congratulate ourselves on these prudent measures; each collection contained nearly the same species, and no precautions were neglected to have the cases, if taken by English or French vessels, remitted to Sir Joseph Banks, or to the professors of natural history at the Museum at Paris. Happily the manuscripts which I at first intended to send with the collection to Cadiz, were not entrusted to our friend and fellow traveller, Fray Juan Gonzales, of the order of the Observance of Saint Francis. That estimable young man, whom I have several times had occasion to name, had followed us to the Havannah in order to return to Spain. He left the island of Cuba soon after us, but the vessel in which he embarked foundered in a tempest on the coast of Africa, and the cargo and crew were all lost. We lost, by this shipwreck, a portion of the duplicates of our herbals, and, what was a more sensible loss for the sciences, all the insects which M. Bonpland had collected in the most difficult circumstances during our voyage to the Oroonoko and the Rio Negro. By a very singular fatality, we remained two years in the Spanish colonies without receiving one letter from Europe; and those which arrived in the three following years made no mention of what we had transmitted. My uneasiness may be imagined for the fate of a *journal* which contained the astronomical observations, and all the measures of height by means of the barometer, of which I had not had the patience to make a detailed copy. After having visited New Grenada, Peru, and Mexico, at the moment of leaving the New Continent, I happened, at the public library of Philadelphia, to cast my eyes on the table of contents of a scientific *review*, where I found these words: "Arrival of M. de Humboldt's manuscripts at his brother's house at Paris, by way of Spain!" I could scarcely suppress an exclamation of joy; never did a table of contents appear to me better made.

While M. Bonpland laboured day and night to divide and put our collections in order, I had the vexation of finding a thousand obstacles to this unexpected departure. There was no vessel in the port of the Havannah that would undertake to conduct us to Portobello or Carthagena; the persons I consulted seemed to take pleasure in exaggerating the inconveniences of the passage of the isthmus, and the slowness of the navigation from north to south, from Panama to Guayaquil, and from Guayaquil to Lima or Valparaiso. They reproached me, perhaps justly, for not continuing to explore the coast and rich possessions of Spanish America, which during half a century had not been open to any foreign traveller. The chances of a voyage round the world, in which vessels in general only touch at some islands, or the barren coast of a continent, did not appear to them preferable to the advantage of studying the interior of New Spain; those regions that furnish alone five-eighths of the mass of silver drawn annually from all the mines of the known globe. To these considerations I opposed the interest of determining on a greater scale, the inflexion of the curves of equal inclination, the decrease of the intensity of the magnetic force of the pole towards the equator, the temperature of the Ocean, variable according to the latitude, the direction of the currents, and the proximity of the sand-banks. The more I saw of contrariety to my purposes, the more I hastened their execution. Not being able to find a passage in any neutral vessel, I freighted a Catalonian sloop, lying in the road of Batabano, which was to be at my disposal to take me either to Portobello or Carthagena, according as the gales of Saint Martha, which blow with great violence at that season below 12° of latitude, would permit. The prosperous state of commerce at the Havannah, and the multiplied connections of that city with the ports of the South Sea, would facilitate for me the means of procuring funds for several years. General Don Gonzalo O'Farrill, alike distinguished by his abilities and the elevation of his character, resided at that time in my native country, as minister of the court of Spain. I could exchange my revenues in Prussia for a part of his at the island of Cuba; and the family of the respectable Don Ygnacio O'Farrill y Herera, brother of the general, concurred kindly in all that could favor my new projects. On the 6th of March, the vessel I had freighted was ready to receive us. The road of Batabano led us once more by Guines to the plantation of Rio Blanco, which the proprietor (Count Jaruco y Mopox) embellished with all the means that a taste for pleasure and a large fortune can furnish. Hospitality, which generally diminishes with the progress of civilization, is still exercised at the island of Cuba with as much kindness as in the most remote parts of Spanish America. Mere scientific travellers find a pleasure in offering the inhabitants the same testimony of gratitude which they have received from those illustrious travellers *, who, wher-

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* The young princes of the house of Orleans (the Duke of Orleans, the Duke of Montpensier, and the Count of Beaujolois), who came from the United States to the

ever I followed their traces in the New World, have left the remembrance of their noble simplicity, their ardour for instruction, and their love of public good.

The road from Rio Blanco to Batabano goes across an uncultivated country, half covered with forests; in the open spots, indigo and the cotton-tree grow wild. As the capsule of the *Gossypium* opens at the season when the northern tempests are most frequent, the down that envelops the grains is swept from one side to the other; and the gathering of the cotton, which is of a very fine quality, suffers greatly from the coincidence of the tempests with the maturity of the fruit. Several of our friends, among whom was M. de Mendoza, captain of the port of Valparaiso, and brother to the celebrated astronomer who resided so long in London, accompanied us to *Potrero de Mopox.* In herbalizing further, towards the south, we found a new palm-tree * with fan-leaves (*Coripha maritima*), having a free thread between the interstices of the folioles. This *Coripha* covers a part of the southern coast, and replaces the majestic *Palma Real* † and the Co-

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Havannah, descending the Ohio and the Mississipi, and who remained during a year at the island of Cuba.

* See *Nova Gen. et Spec.*, tom. i, p. 299.

† Oreodoxa regia.

cos crispa of the northern coast. Porous limestone (of the jurassic formation), appeared from time to time in the plain.

Batabano was * then a poor village, of which the church had been completed only a few years. The *Sienega* begins at the distance of half a league, a marshy soil, extending from the Laguna de Cortez as far as the mouth of the Rio Xagua, on a length of sixty leagues from west to east. It is thought, at Batabano, that in those regions the sea continues to gain upon the land, and that the oceanic irruption was especially sensible at the period of the great heaving up † which took place at the end of the eighteenth century, when the tobacco mills disappeared, and the Rio Chorrera changed its course. Nothing can be more gloomy than the aspect of these marshes around Batabano; no shrub interrupts the monotony of the view; some stunted trunks of palm-trees rise like broken masts, amidst great tufts of Joncaces and Irides. As we staid only one night at Batabano, I regretted much that I was unable to obtain precise information on the two species of crocodiles which infest the *Sienega*. The inhabitants give to one the name of *cayman*, to the other that of *crocodile*, or, as they say commonly in Spain, of *cocodrilo*. They assured us that the latter had most agility, and was higher; his snout is more pointed than that of the *caymans*, and they are never found together. The crocodile is very courageous, and is said to climb into boats when he can find a support for his tail. The extreme boldness of this animal was signalized in the first expeditions of the governor Diego Velasquez *. The *crocodile* goes as far as a league from the Rio Cauto and the marshy coast of Xagua, to devour the pigs in the islands; it is sometimes fifteen feet long, and the most daring will, it is said, pursue a man on horseback, like the wolves in Europe; while the animals exclusively called *caymans* at Batabano, are so timid, that people bathe without apprehension in places where they live in bands. These peculiarities, and the name of *cocodrilo*, given at the island of Cuba, to the most dangerous of the carnivorous serpents, appear to me to indicate a different species from the great animals of the Oroonoko, Rio

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* On the real astronomical position of Batabano, *see* vol. vii, p. 40, 92. Batabano was heretofore placed on the most esteemed marine maps of Bellin, of San Martin Suares, &c. 10° more southerly, lat. 22° 33′. Arrowsmith marks 22° 24′, instead of 22° 43′ 24″. We owe the first good observations made on the southern coast of the island of Cuba, to a captain of a frigate, Don Ventura Barcaiztegui, and Don Francisco Lemaur.

† *See* vol. vii, p. 51.

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* *Herera, Hist. des Ind. occid., Dec. I, lib.* 9, *cap.* 4, p. 232.

Magdalena, and Saint Domingo. Every where else on the continent of Spanish America, the settlers, deceived by the exaggerated accounts of the ferocity of the crocodiles in Egypt, maintain that the *real crocodile* is only found in the Nile, while zoologists have ascertained that there are in America *caymans* or *alligators* with obtuse snouts and legs not indented, and *crocodiles* with pointed snouts and indented legs; and, in the ancient continent, both *crocodiles* and *gaviales*. The *Crocodilus acutus* of Saint Domingo, in which I cannot hitherto specifically distinguish the crocodiles of the great rivers of the Oroonoko and the Magdalena, has even, to use an expression of M. Cuvier*, a resemblance so surprising to the crocodile of the Nile, that it required a minute examination of its parts to prove that the law of Buffon relative to the distribution of species between the tropical regions of the two continents, was not erroneous.

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* *Cuvier, Rech. sur les ossemens fossiles*, tom. v, Pl. II, p. 27. This striking analogy could only have been ascertained by M. Geoffroy de Saint-Hilaire in 1803, when General Rochambeau sent a crocodile from Saint Domingo to the Museum of natural history at Paris. (*Annals du Muséum*, tom. ii, p. 37, 53.) M. Bonpland and myself had made drawings and detailed descriptions in 1801 and 1802, of the same species which inhabit the great rivers of South America, during our navigation on the Apure, the Oroonoko, and the Magdalena. We committed the fault, so common to travellers, of not sending them at that time to Europe, together with some young specimens.

As I could not in my second passage by the Havannah, in 1804, return to the *Sienega* of Batabano, I had the two species, called *caymans* and *crocodiles* by the inhabitants, brought to me at a great expence. Two crocodiles arrived alive; the oldest was four feet three inches long: they were taken with great difficulty, and were transported, muzzled and bound, on a mule; they were vigorous and fierce. In order to observe their habits and movements*, we placed them in a great hall, where, by climbing on a very high piece of furniture, we could see them attack great dogs. Having lived among crocodiles during six months, on the Oroonoko, the Rio Apure, and the Magdalena, we were pleased to observe once more before we returned to Europe, those singular animals, who pass with astonishing rapidity from a motionless state to the most impetuous movements. The animals sent to us from Batabano, as being *crocodiles*, had the snout nearly as sharp as the crocodiles of the Oroonoko and the Magdalena (*Crocodilus acutus*, Cuv.); their colour was a dark-green on the back, and white below the belly; the flanks had yellow spots. I counted, as in all the real crocodiles, thirty-eight teeth in the upper jaw, and thirty in the lower; in the former, the tenth and ninth; and in the latter, the first and fourth, were the largest. In the description made by M. Bonpland and myself, on the spot, we have expressly marked that the lower fourth tooth touches freely the upper jaw. The posterior extremities were palmated. These *crocodiles* of Batabano appeared to us to be specifically identical with the *Crocodilus acutus*: it is true that what was related to us of their habits did not quite agree with what we had ourselves observed on the Oroonoko; but carnivorous serpents, of the same species, are milder and more timid, or fiercer and more courageous, in the same river, according to the nature of the localities*. The animal called *cayman* at Batabano, died on the way, and was not brought to us, so that we could make no comparison of the two species. Are these real *caymans* on the south of the island of Cuba, with an obtuse snout, of which the fourth lower tooth enters into the upper jaw, *alligators* similar to those of Florida? What the planters say of the much longer head of their *cocodrilo del Batabano*, renders this fact almost certain *; and, in that case, the people by a happy instinct have distinguished, in that island, between the *crocodile* and the *cayman*; with the justness that the learned zoologists do at present in re-establishing sub-genders that bear the same names. I have no doubt that the crocodile with a sharp snout, and the alligator or cayman with a snout like a pike *, inhabit at the same time, but in distinct bands, the marshy coast between Xagua, the *Surgidero* of Batabano, and the isle of Pinos. In this island Dampier, no less deserving praise as an observing naturalist than as an intrepid mariner, was struck with the great difference between the *caymans* and the American *crocodiles.* What he relates on that subject, in his voyage to the bay of Campechy, might have excited the curiosity of the learned more than a century ago, if zoologists did not often reject with disdain all that navigators or other travellers, destitute of scientific knowledge, have observed on animals. After having given several characters which are not equally exact, that distinguish *crocodiles* from *caymans,* he traces the geographical distribution of those enormous Sauriens. "In the bay of Campechy, he says, I saw only *caymans* or *alligators;* at the island of Great Cayman, there are *crocodiles* and no *alligators;* at the isle of Pinos, and in the innumerable creeks of the coast of Cuba, there are both *crocodiles* and *caymans* †." I shall add to these valuable observations of Dampier, that the real crocodile

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* M. Descourtilz, who knows the habits of the crocodile better than any other author who has written on that reptile, saw, like M. Dampier and myself, the *Crocodilus acutus* often touch his tail with his mouth. *Voyage d'un Naturaliste*, tom. iii, p. 87.

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* Vol. iv, p. 423; v, p. 448.

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* I thought I had found a slight difference in the great plates of the nape of the neck. The great crocodile of Batabano furnishes, near the head, four tubercles placed in one row, and three ranged in two. In a younger animal I counted, first, a row of four tubercles, then a row of two, followed by a large void space; after which the blades of the back commence. This is the most common disposition of the parts in the crocodile of the Oroonoko. That of the Magdalena presents three rows of tubercles at the nape of the neck, the two first of four, and the latter of two plates. In the specimens of the *Crocodilus acutus* received by the Museum of natural history at Paris from Saint Domingo, there are first two rows of four, and afterwards one of two tubercles. I shall treat of the constancy of this character in the second volume of my collection of Zoology. The four pockets filled with musk (*bolzas del almiscle*) are placed, in the crocodile of Batabano, exactly where I draw them in that of the Rio Magdalena, beneath the lower jaw and near the anus; but I was much surprised at not perceiving that smell at the Havannah, three days after the death of the animal, in a temperature of 30°, while at Mompox, on the banks of the Magdalena, living crocodiles infected our apartment. I have seen since, that Dampier also remarked "an absence of smell in the *crocodile* of Cuba, where the *caymans* spread a very strong smell of musk."

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* *Crocodilus acutus* of Saint Domingo. *Alligator lucius* of Florida and the Mississipi.

† *Dampier's Voyages and Descriptions* (1699), vol. ii, P. I, p. 30 and 75.

(*C. acutus*) is found in the West India islands nearest the main-land, for instance, at the island of Trinidad, la Marguerita, and also, probably, at Curaçao, notwithstanding the want of fresh water *. It is observed, further south (without my having ascertained any of those species of alligators that abound on the coast of Guyana †), in the Neveri, the Rio Magdalena, the Apure, and the Oroonoko, as far as the confluence of the Cassiquiare with the Rio Negro (lat. 2° 2′), consequently more than 400 leagues distant from Batabano. It would be interesting to verify where, on the eastern coast of Mexico and Guatimala, between the Missisipi and the Rio Chagre (in the isthmus of Panama), is found the limit of the different species of carnivorous serpents.

We set sail on the 9th of March, a little uneasy at the extreme smallness of our vessel, of which the tackling left us no place for sleeping but upon deck. The cabin (*camera de poxo*) received no air or light but from above; it was really a hold for provisions, in which we placed our instruments with difficulty. The thermometer kept up constantly at 32° and 33° centisimal; happily these inconveniences lasted only twenty days. The navigation in the canoes of the Oroonoko, and in an American vessel laden with several thousand *arrobas* of salt-meat dried in the sun, had rendered us less particular.

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* *Seba*, P. civ, fig. 1-9.

† Alligator sclerops and Alligator palpebrosus.

The gulf of Batabano, bounded by a low and marshy coast, appears like a vast desert. The fishing-birds, which are generally at their post before the small land-birds, and the indolent *zamuros*[*] are awake, appear in small numbers. The sea is of a greenish-brown, as in some lakes of Switzerland; while the air, on account of its extreme purity, had, at the moment that the sun appeared at the horizon, a cold tint of pale-blue, which landscape-painters observe at the same hour in the south of Italy, and on which distant objects detach themselves with remarkable vigor. Our sloop was the only vessel in the gulf; for the road of Batabano is scarcely visited but by smugglers, or, as they here say politely, *los tratantes*. We have mentioned above, in speaking of the projected canal of Guines[†], how important Batabano might become for the communications of the island of Cuba with the coast of Venezuela. In its present state, without any cleansing having been attempted, we scarcely find nine feet of water *. The port is placed within a bay terminated by Punta Gorda on the east, and by Punta de Salinas on the west: but this bay forms only the concave of a great gulf, which is nearly fourteen leagues from south to north, and, in an extent of fifty leagues, between the Laguna de Cortez and the Cayo de Piedras, is inclosed by an incalculable number of flats and chains of rocks. One great island only, of which the *area* is more than four times the dimensions of that of Martinico, with bare mountains crowned with majestic coniferes, rises amidst this labyrinth. It is the *Isle of Pinos*, called by Columbus *El Evangelista*, and by other pilots of the sixteenth century, *Isla de Santa Maria*. It is celebrated for the mahogany (Swietenia Mahagoni) which it furnishes for commerce. We sailed E.S.E., taking the *passage of Don Cristoval*, in order to reach the rocky isle of *Cayo de Piedras*, and get out of this archipelago, which the Spanish pilots designate, since the first times of the *conquest*, by the names of *Gardens* and *Bowers* (*Jardines y Jardinillos*). The real *Gardens of the Queen* *, nearer cape Cruz, are separated from the archipelago I shall describe, by an open sea thirty-five leagues broad. Columbus gave them these names in 1494, when, on his second voyage, he struggled during fifty-eight days against the winds and currents between the isle of Pinos and the eastern cape of Cuba. He describes the islands of this archipelago as *verdes, llenos de arboledas y graciosos* †.

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[*] The Percnoptère of equinoxial America, *Vultur aura*.

[†] *See* above, p. 244 and following.

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* The largest barks that enter in the *Surgidero* of Batabano take fifteen *palmas* (at nine inches). The good channels are, towards the west, the *Canal del Puerto Frances*, between the western cape of the isle of Pinos and the Laguna de Cortez, and, on the east of the isle of Pinos, the four channels of *Rosario*, the *Gordas*, *Savana de Juan Luis*, and *Don Cristoval*, between the chain of rocks and the coast of Cuba.

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* There exists great geographical confusion even at the Havannah on the ancient denominations of the *Jardines del Rey* and *Jardines de la Reyna.* In the description of the island of Cuba, in the *Mercurio Americano* (vol. ii, p. 388), and in the *Historia natural de la Isla de Cuba* (cap. i, §. 1), published at the Havannah by Don Antonio Lopez Gomez, the two groupes are placed on the southern coast of the island. M. Lopez says that the *Jardines del Rey* extend from the Laguna de Cortez to Bahia de Xagua; but there remains no historical doubt that the governor Diego Velasquez gave his name to the western part of the chain of rocks of the *Old Channel*, between Cayo Frances and le Monillo, on the northern coast of the island of Cuba. (*Herera*, vol. i, p. 8, 81, 55, and 232; vol. ii, p. 181.) The *Jardines de la Reyna*, situate between Cabo Cruz and the port of the Trinity, are in no manner connected with the *Jardines* and *Jardinillos* of the *Isla de Pinos*. Between the two groupes of the chain of rocks are the flats (*placeres*) of la Paz and Xagua.

† *Churchill's Collect.*, p. 569. *Pedro Muñoz, Hist. del Nuevo Mundo*, p. 214, 216.

A part of these pretended gardens is indeed beautiful; the navigator sees the scene change every moment, and the verdure of some of these islands appears the more lovely from the contrast with other chains of rocks that display only white and barren sands. The surface of these sands, heated by the rays of the sun, seem undulating like the surface of a liquid. By the contact of layers of air of unequal temperature, the most varied phenomena of suspension and *mirage* are produced, from ten in the morning till four in the afternoon *. Even in those desert places the sun animates the landscape, and gives mobility to every object where it strikes its rays; to the sandy plain, the trunks of trees, and the rocks that advance in the sea in the form of capes. When the sun appears, these inert masses seem suspended in air; and on the neighbouring beach, the sands present the visual illusion of a sheet of water gently agitated by the winds. A train of clouds suffices to seat the trunks of trees and the suspended rocks again on the soil, to render the undulating surface of the plains motionless, and dissipate the charm which the Arabian, Persian, and Hindoo poets have sung, as "the soft delusion of the solitude of the desert."

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* *See* the measures of extraordinary refraction, which I made at Cumana, vol. iii, p. 552, &c.

We doubled very slowly the cape Matahambre. The chronometer of Louis Berthoud having preserved great precision at the Havannah, I availed myself of this occasion to determine on this and the following days, the positions of *Cayo de Don Cristoval*, *Cayo Flamenco*, *Cayo de Diego Perez*, and *Cayo de Piedras**. I also employed myself in examining the influence which the changes at the bottom of the sea produce on its temperature at the surface †. Sheltered by so many islands, the surface is calm as a lake of fresh water, and the layers of different

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* *See* my *Collection of Astron. Obs.*, vol. ii, p. 109. M. de Bauza has joined my observations to those of M. del Rio, in the sketch of *Jardines y Jardinillos*, which he had the kindness to communicate to me, and which rectifies the southern part of my map of the island of Cuba. (*See* the second drawing off of that map, in 1826.)

† I found, in degrees of the thermometer of Reaumur :

SEA.	AIR.	DEPTH.	PLACES.
19·7°	22·3°	10 feet.	Eight miles north of Punta Gorda.
18·8	23·0	7½	Between the chain of rocks of Las Gordas and of Don Cristoval.
19·7	22·2	10	Around Cayo Flamenco.
20·7	22·0	80	Gulf between Cayo Flamenco and Cayo de Piedras.
19·6	24·2	9	Eastern bank of the gulf, near Cayo de Piedras.
18·2	24·3	8	A little more eastward.
21·5	23·0	……	No bottom, south of Xagua.

depths not being mixed, the smallest change indicated by the sound, acts on the thermometer. I was surprised to see that on the east of the little Cayo of Don Cristoval the high banks are only distinguished by the milky colour of the water, like the bank of Vibora, south of Jamaica, and many other banks which I ascertained by means of the thermometer. The bottom of the rock of Batabano is a sand composed of destroyed corals; it nourishes *fuci* which scarcely ever come to the surface; the water, as I have already observed, is greenish; and the absence of the milky tint is, no doubt, owing to the perfect calm which reigns in those regions. Whenever the agitation is propagated to a certain depth, a very fine sand, or calcareous particles suspended in the water, renders it troubled and milky. There are flats, however, which are distinguished neither by the colour nor by the low temperature of the waters, and I believe that phenomenon depends on the nature of a *hard* and rocky *bottom,* destitute of sand and corals, on the form and declivity of the shelvings, the swiftness of the currents, and the want of the propagation of motion towards the lower layers of the water. The cold frequently indicated by the thermometer, at the surface of the high banks, is owing to the molecules of water which the rays of heat and the nocturnal cooling cause to fall from the surface to the bottom, and which are stopped in their fall by the high banks, and also to the mixture of the layers of very deep water, that rise on the shelvings of the banks as on an inclined plane, to mix with the layers of the surface.

Notwithstanding the smallness of our bark, and the boasted skill of our pilot, we often ran a ground. The bottom is soft, and there is no danger of shipwreck; at sun-set, however, near the *pass of Don Cristoval*, we preferred to remain at anchor. The first part of the night was beautifully serene: we saw an incalculable number of falling stars on the side of the land, all following the same direction, opposite to that of the wind which blew in the low regions of the atmosphere. The most absolute solitude prevails in this spot, which, in the time of Columbus, was inhabited, and frequented by a great number of fishermen. The inhabitants of Cuba then employed a small fish to take the great sea-turtles; they fastened a long cord to the tail of the *revès* (the name given by the Spaniards to that species of the Echeneis genera *). The *fisher-fish*, by means of the flattened disk, furnished with suckers on his head, fixed himself on the shell of the sea-turtle, which is so common in the narrow and winding channels of the *Jardinillos*. "The *revès*, says Christopher Columbus, will sooner suffer himself to be cut in pieces than let go the body to which he adheres." The Indians draw to the shore by the same cord, the *fisher-fish* and the turtle. When Gomara, and the learned secretary of the emperor Charles V, Peter Martyr d'Anghiera, published this fact in Europe, which they had learnt from the companions of Columbus, the public no doubt received it as a *traveller's tale*. There is indeed an air of the marvellous in the recital of d'Anghiera, which begins in these words: "Non aliter ac nos canibus gallicis per æquora campi lepores insectamur, incolæ (Cubæ insulæ) venatorio pisce pisces alios capiebant *." We now know from the

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* The *sucet* or *guaican* of the natives of Cuba; called in a characteristic manner by the Spaniards *revès*, that is, *fish placed on the back, placed the wrong way.* In fact, at first sight, the position of the back and the abdomen is confounded. Anghiera says: *Nostrates Reversum appellant, quia versus venatur.* I examined a *remora* of the South Sea

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during the passage from Lima to Acapulco. As he lived a long time out of the water, I tried experiments on the weight he could carry before the blades of the disk loosened the plank to which the animal was fixed; but I lost that part of my journal. It is, no doubt, the fear of danger that engages the *remora* not to loose its hold when he feels that he is pulled by a cord, or by the hand of man. The *sucet* spoken of by Columbus and Martin d'Anghiera, was probably the Echeneis Naucrates, and not the Echeneis Remora. (*See* my *Collection of Obs. of Zoology*, vol. ii, p. 192.)

* *Fernand Colomb*, in *Churchill Coll.*, vol. ii, cap. 56, p. 560. *Petr. Mart. Oceanica*, 1532, *Dec. I*, p. 9. *Gomara, Hist. de las Indias*, 1553, fol. 14. *Herera*, tom. i, p. 55.

united testimony of Captain Rogers, Dampier, and Commerson *, that the same artifice resorted to in the *Jardinillos* to catch turtles, is employed by the inhabitants of the eastern coast of Africa, near cape Natal, at Mozambique, and at Madagascar. Men, having their heads covered with great calebashes, pierced with holes, took ducks in Egypt, at Saint Domingo, and in the lakes of the valley of Mexico, by hiding themselves in the water, and seizing the birds by the feet. The Chinese, from the highest antiquity, use Cormorants, a bird of the family of the Pelicans, which they send to fish on the coast, placing rings round his neck to prevent him from swallowing his prey, and fishing for himself. In the lowest degree of civilization, all the sagacity of man is displayed in the stratagems of hunting and fishing. Nations, who probably never had any communication with each other, furnish the most striking analogies in the means fitted to exert their empire over brute animals.

We were three days before we could get out of this labyrinth of *Jardines* and *Jardinillos*. At night we remained at anchor; and in the day we visited the islands or chains of rocks the most easy of access. As we advanced towards the east, the sea became less calm, and the high banks began to be distinguished by a milky water. On the boundary of a sort of gulf between Cayo Flamenco and Cayo de Piedras, we found that the temperature of the sea, at its surface, augmented suddenly from 23·5° cent. to 25·8°. The geognostic constitution of these rocky islands that rise around the *island of Pinos*, fixed the more my attention, as I had always believed with difficulty in those edifices of lithophite coral of Polynesia, which are said to rise from the abyss of the Ocean, towards the surface of the water. It appeared to me more probable that these enormous masses had some primitive or volcanic rock for a basis, to which they adhered at small depths. The formation, partly compact and lithographic, partly bulbous, of the *limestone of Guines*, had followed us as far as Batabano: it is somewhat analogous to jura limestone; and, judging from the exterior aspect, the islands of *Caymans* are composed of the same rock. If the mountains of the *isle of Pinos*, which present at the same time (as it is said by the first historians of the conquest) *pineta* and *palmeta* *, are visible at twenty marine leagues †, they must attain a height of more than five hundred toises: I have been assured that they also are formed of a limestone altogether similar to that of Guines. From these facts, I expected to find the same rock (jurassic) in the *Jardinillos:* but I saw, in the chain of rocks that rises generally five to six inches above the surface of the water, only a *fragmentary rock,* in which angular pieces of madrépores are cemented by quartzous sand. Sometimes the fragments have a volume of one to two cubic feet, and the grains of quartz so disappear, that in several layers one would be tempted to think that the lithophite polypiers have remained on the spot. The total mass of this chain of rocks appears to me a real *limestone aglomerat,* somewhat analogous to the earthy limestone of the peninsula of Araya*, near Cumana, but of a much more recent formation. The inequalities of this coral rock are covered by a *detritus* of shells and madrepores. Whatever rises above the surface of the water is composed of broken pieces, cemented by the carbonate of lime, in which grains of quartzous sand are set. Are edifices of polypiers still living, to be found at a great depth below this fragmentary rock of coral? Are these polypiers fixed on the jurassic formation? Of this I am ignorant. The pilots believe that the sea diminishes in these latitudes, because they see the chain of rocks augment and rise, either by the earth which the waves heave up, or by successive agglutinations. It is not impossible that the enlarging of the channel of Bahama, by which the waters of the *Gulf-stream* issue, may cause in the lapse of ages, a slight lowering of the waters south of Cuba, and above all in the gulf of Mexico, the center of the grand whirlpool of the pelagic flood which runs along the United States, and throws the fruits of the tropical plants on the coast of Norway [*]. The configuration of the coast, the direction, the force, and the duration of certain winds and currents, the changes which the barometric heights undergo on account of the variable predominance of those winds, are causes of which the concurrence may alter, in a long space of time, and in circumscribed limits of extent and height, the equilibrium of the seas [†].

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* *Dampier's Voyages*, vol. ii, Pl. iii, p. 110. *Lacépède, Hist. nat. des poissons*, tom. iii, p 164.

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* *Petr. Martyr, Dec. III, lib.* 10, p. 68.

† *Dampier, Discourse of Winds, Breezes, and Currents,* 1699, chap. vii, p. 85.

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* Cerro del Barigon.

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[*] "The Gulf-stream, between the Bahamas and Florida, is very little wider than Behring's Strait; and yet the water rushing through this passage is of sufficient force and quantity to put the whole northern Atlantic in motion, *and to make its influence be felt in the distant strait of Gibraltar and on the more distant coast of Africa.*" (*Quarterly Rev.*, 1818, *Feb.*, p. 217.)

[†] I do not pretend to explain, by the same causes, the great phenomena of the coast of Sweden, where the sea has, on some points, the appearance of a very unequal lowering,

When the coast is so low, that the level of the soil, at a league within the islands, does not change a few inches, these swellings and diminution of the waters strike the imagination of the inhabitants.

The *Cayo bonito*, which we first visited, merits that name* from the richness of its vegetation. Every thing announces that it has been long above the surface of the Ocean; and the interior is not more depressed than the banks. On a layer of sand and ground-shells, five to six inches thick, covered by a fragmentary madreporic rock, rises a forest of Paletuviers (Rhizophora). From their form and foliage, they might be taken at a distance for laurel-trees. The Avicennia, the Batis, small Euphorbes, and some graminas, fix, by the intertwining of their roots, the moving sands. But what above all characterises the Flora † of

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of three to five feet in 100 years. (Bruncrona and Hallstrœm, in *Pogendorff's Annalen*, 1824, *St.* 11, p. 308-328. *Hoff, Geschichte der Erdoberfláche*, vol. i, p. 405-406.) The great geologist, M. Léopold de Buch, has spread a new interest on these observations, in examining whether it be not rather some parts of the continent of Scandinavia which insensibly heaves up. (*Reise durch. Norwegen*, vol. 2, p. 291.) An analogous supposition was made by the inhabitants of Dutch Guyana. (*Bolingbroke, Voyage to Demerary*, p. 148.)

* *Bonito*, pretty.

† We gathered, Cenchrus myosuroides, Euphorbia buxi-

these *coral islands*, is the magnificent Tournefortia gnaphalioides of Jacquin, with silvered leaves, which we found here for the first time. This plant lives in *society*, and is a real shrub, four feet and a half to five feet high, and of which the flowers spread an agreeable perfume. It makes alike the ornament of Cayo Flamenco, Cayo Piedras, and perhaps of the greater part of the low lands of the *Jardinillos*. While we were employed in herbalizing, our mariners were seeking for langoustes. Irritated at not finding them, they avenged themselves by climbing on the Paletuviers, and making a horrible carnage of the young *Alcatraz*, grouped two by two in their nests. This name is given, in Spanish America, to the brown Pelican with a swan-tail, of Buffon. With the stupid confidence and carelessness peculiar to the great pelagic birds, the Alcatraz forms his nest

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folia, Batis maritima, Iresine obtusifolia; Tournefortia gnaphalioides, Diomedea glabrata, Cakile cubensis, Dolichos miniatus, Parthenium hysterophorus, &c. The last plant, which we had found in the valley of Caraccas and on the temperate table lands of Mexico, between 470 and 900 toises high, covers the fields of the island of Cuba. It is used by the inhabitants for aromatic baths, and to chase away the fleas which are so frequent in tropical climates. At Cumana, the leaves of several species of Cassia are employed, on account of their smell, against those pernicious insects.

where some branches of trees are joined together. We reckoned four or five nests on the same trunk of a Rhizophora. The young birds defended themselves valiantly with their enormous beaks, which are six to seven inches long; the old hovered over our heads, making hoarse and plaintive cries; blood streamed from the tops of the trees, for the sailors were armed with great sticks and cutlasses (*machetes*). In vain we reproached them for this want of pity, and these useless torments. Condemned to long obedience in the solitude of the seas, they find a pleasure in exercising a cruel empire on animals, when the occasion offers; the ground was covered with wounded birds struggling with death. At our arrival a pròfound calm prevailed in this little spot of earth; now, every thing seemed to say: Man has passed here.

The sky was covered with reddish vapours, which were dissipated towards the south-west; we hoped, in vain, to discover the heights of the *isle of Pinos*. That spot has a charm which is wanting to the greater part of the New World. It presents remembrances linked with the greatest names of the Spanish monarchy, those of Christopher Columbus and of Hernand Cortez. It was on the southern coast of the island of Cuba, between the bay of Xagua and the *isle of Pinos*, that the admiral, in his second voyage, saw, with astonishment, "that mysterious king who spoke to his subjects only by signs, and that groupe of men who wore long white tunicks, and resembled the monks of *Merced*, while the rest of the people were naked." "Columbus, in his fourth voyage, met in the *Jardinillos*, great boats filled with Mexican Indians, and laden with the rich productions and merchandize of Yucatan." Seduced by his ardent imagination, he thought he had heard from those navigators, "that they came from a country where the men were mounted on horses *, and wore crowns of gold on their heads." Already "Catayo (China), the empire of the Great Khan, and the mouth of the Ganges," appeared to him so near, that he hoped soon to employ two Arabian interpreters, whom he had embarked at Cadiz, in going to America. Other remembrances of the *isle of Pinos,* and the surrounding *Gardens,* are connected with the conquest of Mexico. When Hernand Cortès prepared his great expedition, he was wrecked in navigating from the port of Trinidad to cape Saint Antonio, with his *Nave Capitana,* on one of the flats of the *Jardinillos*. He was believed to be lost during five days, when the valiant Pedro de Alvarado sent (in November, 1518,) from the port of Carenas* (the

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* Compare *Lettera rarissima di Christoforo Colombo di 7 di Julio* 1503, p. 11, with *Herera*, Dec. I, p. 125, 131. Nothing can be more touching and pathetic than the expression of melancholy which prevails in the letter of Columbus, written at Jamaica, and addressed to king Ferdinand and queen Isabella. I recommend to those who wish to study the character of this extraordinary man, the recital of a nocturnal vision, in which a celestial voice, in the midst of a tempest, encourages the old man by these words: "Iddio maravigliosamente fece sonar tuo nome nella terra. Le Indie que sono parte del mondo cosi ricca, te le ha date per tue; tu le hai repartite dove ti è piaciuto, e ti dette potenzia per farlo. Delli ligamenti del mare Oceano che erano serrati con catene cosi forte, ti donò le chiave, &c." This fragment, full of elevation and poetry, has only reached us in an ancient Italian tradition; for the Spanish original, mentioned in the Bibliotica nautica of Don Antonio Leon, has not hitherto been found. I could add other expressions of great simplicity, from the lips of him who discovered a new

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world: "Your highness, says Columbus, may believe me, the globe of the earth is far from being so great as the vulgar admit. I was seven years at your royal court, and during seven years was told that my enterprise was a folly. Now that I have opened the way, tailors and shoe-makers ask the privilege of going to discover new lands. Persecuted, forgotten as I am, I never think of Hispaniola and Paria without my eyes being filled with tears. I was twenty years in the service of your highness; I have not a hair that is not white; my body is weakened; I can no longer weep, *pianga adesso il cielo e pianga per me la terra; pianga per me chi ha carità, verità, giustizia.*" *Let. rar.*, p. 13, 19, 34, 37.

* At that period there were two settlements, one at Puerto de Carenas, in the ancient Indian province of the Havannah (*Herera*, *Dec. I*, p. 276, 277); and the other, the most considerable, in the Villa de San Cristoval de Cuba.

Havannah) three vessels in search of him. In February 1819, Cortès assembled his whole fleet near cape Saint Antonio, probably on the spot which still bears the name of *Ensenada de Cortes*, west of Batabano, and opposite the isle of Pinos. From thence, believing he should better escape the snares laid for him by the governor Velasquez, he passed almost clandestinely to the coast of Mexico. Strange vicissitude of human things! The empire of Montezuma was shaken by a handful of men, who, from the western extremity of the island of Cuba, landed on the coast of Yucatan; and, in our days, three centuries later, that very Yucatan, now a part of the new confederation of the free states of Mexico, has nearly menaced with conquest the western coast of Cuba.

On the morning of the 11th March, we visited Cayo Flamenco. I found the latitude 21° 59′ 39″. The center of this island is depressed, and only 14 inches higher than the surface of the sea. The water here is brackish; while in other *Cayos* it is quite fresh. The mariners of Cuba, as well as the inhabitants of

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These settlements were only united in 1519, when the Puerto de Carenas took the name of San Cristoval of the Habana. *See* above, p. 401: "Cortès," says Herera (Dec. II, p. 80 and 95), "pasó á la Villa de San Cristoval que á la sazon estaba *en la costa del sur*, y despues se pasó á la Habana."

the lagunas of Venice, and some modern naturalists, attribute this freshness of the water to the action of the sands in filtering sea-water. But what is this mode of action of which the supposition is not justified by any chemical analogy? The cayos also are composed of rocks, and not of sands, and their smallness renders it extremely difficult to admit that the pluvial waters unite in a permanent pool. Perhaps the fresh water of this chain of rocks comes from the neighbouring coast, from the mountains of Cuba, by the effect of hydrostatic pressure. This would prove a prolongation of the strata of jurassic limestone below the sea, and a superposition of coral rock on that limestone *. It is a too general prejudice, to consider every source of fresh or salt water as a local phenomenon: the currents of water circulate in the interior of the lands between strata of rocks of a particular density or nature, at immense distances, like the floods that

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* The ancients were acquainted with eruptions of fresh water in the sea, near Bayæ, Syracusa, and Aradus (in Phenicia). *Strabo,* lib. 16, p. 754. The coral islands that surround Radak, above all the low isle of Otdia, furnish also fresh water. (*Chamisso* in *Kotzebue, Entdekkungs-Reise,* vol. iii, p. 108.) We cannot enough recommend to travellers to examine carefully the circumstances which these phenomena present at the level of the sea.

furrow the surface of the globe. The learned engineer, Don Francisco Le Maur, the same who has since displayed such firmness and energy in defence of the castle of San Juan d'Uloa, informed me, that in the bay of Xagua, half a degree east of the *Jardinillos*, there issue frothing, in the middle of the sea, springs of fresh water, two leagues and a half from the coast. These waters gush up with such force, that they cause a shock in the waves often dangerous for small canoes. Vessels that are not going to Xagua sometimes take in water from this briny source; and this water is fresher and colder in proportion as it is drawn deeper. The lamatins (*manatis*), guided by instinct, have discovered this region of fresh waters; and the fishermen, who like the flesh of these herbivorous ceti *, find them in abundance in the open sea.

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* Do they feed upon fucus in the sea, as we saw them feed on the banks of the Apure and the Oroonoko on several species of Panicum and Oplismenus, (*camalote*)? It appears that it is a phenomenon common enough, to find on the coast of Tabasco and Honduras, at the mouth of rivers, the lamantins swimming in the sea, as the crocodiles do sometimes. Dampier distinguishes between the *Fresh-water Manati* and the *Sea-kind.* (Voyages and Descr., vol. ii, pl. ii, p. 109.) Among the *Cayos de las doce leguas*, east of Xagua, some islands bear the name of *Meganos del Manati.* I have

Half a mile east of Cayo Flamenco, we passed close to two rocks at the edge of the water, on which the waves rush tumultuously. They are * the *Piedras de Diego Perez* (latitude 21° 58′ 10″). The temperature of the sea, at its surface, lowers at this point to 22·6° cent., the depth of the water being only 6½ feet. In the evening we went on shore at *Cayo de Piedras ;* they are two rocks joined by breakers, in the direction of N.N.W. to S.S.E. These rocks being somewhat insulated (forming the eastern extremity of the *Jardinillos*), many vessels are lost upon them ; the *Cayo de Piedras* is almost destitute of shrubs, because the shipwrecked crews cut them in their distress, to make fire-signals. The banks of the island are very steep on the sea-side ; towards the middle there is a small basin of fresh water. We found a block of madrepore in the rock, of more than three cubic feet. We had no doubt that this limestone formation, which at a distance re-

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elsewhere said, that the observations we have just noted on the habits of the crocodiles and the lamantins, have a great interest for the geognist, who is often embarrassed, by finding the bones of land animals and pelagic productions collected together in the same soil.

* The Cayos Flamenco, Diego, Perez, Don Cristobal, and Piedras, are placed 2′ further north in the table of positions published by M. Espinosa. (*Mem. de los Nav. Esp.*, vol. ii, p. 65.)

sembles jurassic limestone, is a fragmentary rock. It would be well that this chain of cayos which surround the island of Cuba, were examined by geognostic travellers, in order to determine what may be attributed to the animals which still work at the bottom of the sea, and what belongs to the real tertiary formations, of which the age goes up to that of the coarse limestone abounding in remains of lithophite coral. In general, what surmounts the waters is only brechia, or aggregate of madreporic fragments cemented by carbonate of lime, broken shells, and sand. It is important to examine in each cayos on what this brechia reposes; if it covers edifices of mollusques still living, or those secondary and tertiary rocks, which, by their aspect, and the preservation of the remains of coral they contain, one would be inclined to think were the product of our days? The gypsum of the cayos opposite San Juan de los Remedios, on the northern coast of the island of Cuba, merits great attention. Its age goes up no doubt beyond historic times, and no geognost will believe that it is the work of the mollusques of our seas.

From the *Cayo de Piedras* we began to discern, towards the E.N.E., the lofty mountains that rise beyond the bay of Xagua. We again remained during the night at anchor; and, the next day (12th March), we turned round the passage between the northern cape of the *Cayo de Piedras* and the island of Cuba, we entered a sea free from breakers. Its blue colour of dark indigo, and the increase of the temperature, proved how much the depth of the water had augmented. The thermometer, which, at 6½ and 8 feet of soundings, we had several times seen at the surface of the ocean, at 22·6°, now kept up at 26·2° cent. During these experiments, the air, in the day, was from 25° to 27°, as among the *Jardinillos.* We tried under favor of the variable winds of sea and land, to go up towards the east, as far as the port of la Trinidad, in order to find less difficulty from the north-east winds that then prevail in the open sea, to make the passage to Carthagena, of which the meridian falls between Santiago of Cuba and the bay of Guantanamo. Having passed the marshy coast of *Camareos,* where Bartholemeo de las Casas, celebrated for his humanity and his noble courage, had obtained*, in 1514, from his friend Velasquez, the governor, a good *repartimiento de Indios,* we arrived (latitude 21° 50′) in the meridian of the entrance of the *Bahia de Xagua.* The longitude the chronometer gave me at this point was almost identical with that since published (in 1821) in the map of the *Deposito hidrografico of Madrid.*

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* This he renounced the same year from a scruple of conscience, during a short stay at Jamaica.

The port of Xagua is one of the finest, but least frequented of the island. *No debe tener otro tal en el mundo,* said the *Coronista major* Antonio de Herera [*]: the surveys and projects of defence made by M. Le Maur, at the time of the commission of Count Jaruco, have proved that the anchorage of Xagua merited the celebrity it had acquired since the first years of the *conquest.* We yet find only a small groupe of houses and a fort *(castillito),* which prevents the English navy from repairing their vessels in the bay, which used to be done very tranquilly in the midst of war with Spain. On the east of Xagua, the mountains *(Cerros de San Juan)* draw near the coast, and assume an aspect more and more majestic, not from their height, which does not seem to exceed three hundred toises [†], but from their steepness and general form. The coast, I was told, is so steep that a frigate can approach the mouth of the Rio Guaurabo. When the temperature of the air diminished at night to 23°, and the wind blew from the land, it brought that delicious odour of flowers and honey which characterizes the shores of the island of Cuba [‡]. We sailed along the coast at two or three miles distance: on the 13th March, a little before sunset, we were opposite the mouth of the Rio San Juan, dreaded by navigators on account of the innumerable quantity of *mosquitos* and *sancudos* which fill the atmosphere. It is like the opening of a ravin, in which vessels drawing a great deal of water could enter, if a shoal *(placer)* did not obstruct the passage. Some horary angles gave me the longitude 82° 40′ 50″, for this port, which is frequented by the smugglers of Jamaica and the corsairs of the island of Providence. The mountains that command the port scarcely rise to 230 toises *. What a desert coast! not one light announced a fisherman's hut. There exists no village from Batabano to Trini-

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[*] Dec. I, lib. ix, p. 233.

[†] Distance estimated three marine leagues. Angle of height not corrected by the curve of the earth and refraction, 1° 47′ 10″. Height, 274 toises.

[‡] *See* above, vol. vi, p. 317. I have already remarked (vol.

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vii, p. 220), that the wax of Cuba, which is a very important object of trade, is produced by the bees of Europe (the species Apis, Latr.). Columbus says expressly, that in his time, the inhabitants of Cuba did not collect wax. The great loaf of that substance which he found in the island in his first voyage, and presented to King Ferdinand in the celebrated audience of Barcelona, it was afterwards known, had been brought thither by Mexican barks from Yucatan. (*Herera,* Dec. I, p. 25, 131, 270.) It is curious to observe that the *wax of Melipones* was the first production of Mexico that fell into the hands of the Spaniards, in the month of November, 1492. *See* my *Rec. d'obs. de Zoologie,* tom. i, p. 251; and *Polit. Essay,* vol. iii, p. 62.

* Dist. 3½ miles. Angle of height of the culminant point of Serrania, 3° 56′.

dad, a distance of fifty leagues; you scarcely find two or three *corrales* of hogs or cows. Yet, in the time of Columbus, this territory was inhabited, even along the shore. When the ground is dug to make wells, or torrents furrow the surface of the earth in floods, hatchets of stone and other utensils in copper * are often discovered, the works of the ancient inhabitants of America.

I engaged the captain at sun-rise to heave the lead. There was no bottom found at sixty fathoms; and the surface of the ocean was warmer than any where else; it was at 26·8°; the temperature exceeded 4·2° that which we had found near the *breakers* of Diego Perez. At the distance of half a mile from the coast, the water of the sea was not more than 25·5°; we had no opportunity of sounding, but the depth of the water had no doubt diminished. On the 14th March, we entered the Rio Guaurabo, one of the two ports of *Trinidad of Cuba*, to put the *practica* of Batabano on shore, who had piloted us across the flats of the *Jardinillos*, causing us to run a-ground several times. We also hoped to find a packet-boat (*correo maritimo*) in this port, which would take us to Carthagena. I disembarked towards the evening, and placed the compass of inclination of Borda, and the artificial horizon, on the shore, in order to observe the passage of some stars by the meridian; but we had scarcely begun our preparations, when some small traders, Catalanians (*pulperos*), who had dined on board a foreign ship recently arrived, invited us gaily to accompany them to the town. These good people made us mount two by two on the same horse; and, as the heat was excessive, we did not hesitate to accept their offer. From the mouth of the Rio Guaurabo to Trinidad, is nearly four miles, in a north-west direction. The road passes by a plain which seems as if it had been levelled by a long sojourn of the waters. It is covered with a beautiful vegetation, to which the *Miraguama*, a palm-tree with silvered leaves, gives a peculiar character*. This fertile soil, although of *tierra colorada,* waits only the hand of man to be ploughed, and yield excellent harvests. A very picturesque view opens towards the west, on the *Lomas of San Juan,* a chain of calcareous mountains from 1800 to 2000 feet high, and very steep towards the south. These bare and barren summits form sometimes rounded groupes, sometimes real horns *, a little inclined. Notwithstanding the great lowering of the temperature during the season of *Nortes,* snow is never seen, and only a hoar-frost *(escarcha)* on these mountains and those of Santiago. I have mentioned in another place, this want of snow, which it is difficult to explain. In going out of the forest, we perceived a curtain of hills, of which the southern slope is covered with houses; this is the town of Trinidad, founded in 1514, by the governor Diego Velasquez, on account of "the rich mines of gold" which it was said were discovered in the little valley of Rio Arimao †.

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* No doubt the copper of Cuba. The abundance of this metal in its native state, would engage the Indians of Cuba and Hayti to melt it. Columbus says, that there were masses of native copper at Hayti, of the weight of six *arrobas*, and that the boats of Yucatan, which he met with on the eastern coast of Cuba, carried among other Mexican merchandize, "crucibles to melt copper." (*Herera*, Dec. 1, p. 86 and 131.)

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* Corypha Miraguama. *See* the *Nova Gen.,* t. i, p. 298. It is probably the same species which struck M.M. John and William Fraser (father and son), in the vicinity of Matanzas. These botanists, who have brought a great number of precious plants to the gardens of Europe, were shipwrecked on their voyage to the Havannah from the United States, and

saved themselves with difficulty on the cayos, at the entrance of the Old Channel, a few weeks before my departure for Carthagena.

* Wherever the rock appears, I saw compact limestone, whitish-grey, partly porous, and partly with smooth fracture, as in the jurassic formation.

† This river enters towards the east in the Bahia de Xagua.

The streets of Trinidad have all a rapid descent: the inhabitants here complain, as for the most part in Spanish America, of the bad choice of the spot made by the *Conquistadores*, founders of new towns*. At the northern extremity is the church of *Nuestra Señora de la Popa*, a celebrated place for pilgrimages. This point appeared to me 700 feet above the level of the sea; it commands, like most of the streets, a magnificent view of the ocean, the two ports (*Puerto Casilda* and *Boca Guaurabo*), a forest of palm-trees, and the groupe of the lofty mountains of San Juan. Having forgot to have the barometer brought to the town with the rest of my instruments, I tried, the next day, to determine the elevation of la *Popa*, by taking alternatively the height of the sun above the horizon of the sea, and in an artificial horizon. I had already employed this method † at the castle of Murviedro, in the ruins of Sagonte, and at Cabo Blanco, near La Guayra: but the horizon of the sea was misty, and, in some parts, interrupted by those dark streaks that announce small currents of air*, or a play of extraordinary refractions. We were received at the town of Trinidad (now *Ciudad*) with the kindest hospitality, by the administrator of the *Real Hacienda*, M. Munoz. I made observations during a great part of the night, and found the latitude, near the cathedral, by the *Spica Virginis*, α of the Centaur, and β of the Cross of the South, under circumstances not equally favorable, to be 21° 48′ 20″. My chronometric longitude was 82° 21′ 7″. I heard, at my second passage by the Havannah, in returning from Mexico, that this longitude was nearly identical with that obtained by the captain of a frigate, Don Jose del Rio, who had long resided on that spot, but that he marked the latitude of the town at 21° 42′ 40″. I have discussed this difference in another place†: it suffices to remark here, that M. de Puységur found 21° 47′ 15″, and that four stars of the Great Bear, observed by Gamboa, in 1714, gave M. Oltmanns (in determining the declination according to the catalogue of Piazzi), 21° 46′ 35″.

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* Was the town founded by Velasquez situated in the plain and nearer the ports of Casilda and Guaurabo? Some inhabitants think that the fear of the French, Portugueze, and English free-booters led to the choice of this spot in the islands, on the declivity of the mountains, where, as from a watch-house, the approach of the enemy could be discovered; but it seems to me that these fears could not be felt before the government of Hernando de Soto. The Havannah was sacked for the first time by French corsairs, in 1539.

† A method of finding the depression of the horizon by means of an instrument of reflexion.

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* According to the opinion of a great naturalist, Mr. Wollaston, whom I consulted on this curious phenomenon, these black streaks are perhaps a part of the surface of the ocean which is nearer, and which the wind begins to curl. In that case, it must be by the opposition of colour, that the true horizon, which is more distant, becomes invisible to the eye.

† *Rec. d'obs. astr.*, tom. ii, p. 72. In my map of the

The *Teniente Governadore* of Trinidad, whose jurisdiction then extended to Villa Clara, Principe, and Santo Espiritu, was nephew to the celebrated astronomer Don Antonio Ulloa. He gave us a grand entertainment at which we found some French emigrants of Saint Domingo, who had brought their talents and industry to that country. The exportation of the sugar of Trinidad, by the registers of the custom-house, did not then exceed 4000 cases. The people complained "of the obstacles which the general government, from its unjust predilection for the Havannah, opposed to the development of agriculture and commerce, in the center and the eastern part of the island; they complained of the great accumulation of wealth, population, and power in the capital, while the rest of the country was almost a desert; and that several smaller centers dis-

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island of Cuba, I adopted the position given me by the observations of March 14th, 1801; in the map of the *Deposito of Madrid*, published at Paris, in 1824, the result of M. del Rio was preferred. (*Espinosa, Mem.*, tom. ii, p. 65.)

tributed at equal distances over the whole surface of the island, would be far preferable to the actual system, which had collected on one point luxury, corruption of manners, and the yellow fever." These exaggerated charges, these complaints of provincial towns against the capital, are the same in every region. It cannot be doubted, that in political as in physical organization, the general well-being depends on life universally spread; but we must distinguish between the pre-eminence which arises from the natural progress of things, and that which is the effect of the measures of government.

The advantage of having two ports is often discussed at Trinidad; it would perhaps be better if the municipality, which has but small funds at its disposition, were occupied in improving only one. The distance of the town from Puerto de Casilda and Puerto Guaurabo, is nearly the same; yet the expence of transport is greatest in the former port. The Boca del Rio Guaurabo, defended by a new battery, furnishes safe anchorage, although less sheltered than that of Puerto Casilda. Barks that draw little water, or are lightened to pass the bar, can go up the river and approach the town within a mile. The packet-boats *(correos)* that touch at Trinidad de Cuba, prefer in general the Rio Guaurabo, where they find safe anchorage without having need of a pilot. The Puerto Casilda is more inclosed, and goes further back into the land; but cannot be entered without a pilot, on account of the breakers (*arrecifes*) of Mulas and Mulattas. The great mole, constructed with wood, and very useful to commerce, was damaged in discharging pieces of artillery. It is entirely destroyed, and it was undecided whether to reconstruct it with masonry, according to the project of Don Luis de Bassecourt, or to open the bar of Guaurabo by dragging it. The great inconvenience of Puerto de Casilda is the want of fresh water, which vessels are forced to seek at the distance of a league; and in doubling the western point, and being exposed, in time of war, to be taken by corsairs. We were assured that the population of Trinidad with the farms that surround it, in a circumference of 2000 toises, amounts to 19,000. The cultivation of sugar and coffee has considerably augmented; the cereals of Europe are cultivated further north, towards Villa Clara.

We passed a very agreeable evening in the house of one of the richest inhabitants, Don Antonio Padron, where we found assembled in *tertulia* all the good company of Trinidad. We were again struck with the gaiety and vivacity that distinguished the women of Cuba, in the province as in the capital: these are happy gifts of nature, to which the refinements of

European civilization might lend a charm, but which have the power to please in their primitive simplicity. We quitted Trinidad in the night of the 15th March, and our departure was very unlike our entry into the town, on horseback with the Catalanian shopkeepers. The municipality caused us to be conducted to the mouth of the Rio Guaurabo in a fine carriage lined with old crimson damask; and, to add to our confusion, an ecclesiastic, the poet of the place, completely dressed in velvet, notwithstanding the heat of the climate, celebrated, in a sonnet, our voyage to the Oroonoko.

On the road leading to the port, we were singularly struck with a spectacle which our stay of two years in the hottest part of the tropics might have rendered familiar to us; but I had no where seen such an innumerable quantity of phosphorescent insects *. The grass that covers the ground, the branches and foliage of the trees, all shone with that reddish and moveable light, of which the intensity varies according to the will of the animal by which it is produced. It seemed as if the starry firmament reposed on the savannah! In the hut of the poorest inhabitants of the country, fifteen *cocuyos*, placed in a calebash pierced with holes, serves to search for objects during the night. To shake the vase with force, is all that is necessary to excite the animal to augment the splendour of the luminous disks placed on each side of his body. The people say, with a simple truth of expression, that calebashes filled with *cocuyos,* are lanterns always lighted. They are in fact, only extinguished by the sickness or death of the insects, who are easily fed with a little sugar-cane. A young woman at Trinidad de Cuba told us, that during a long and difficult passage from the main-land, she always made use of the phosphorescence of the *cocuyos,* when she gave her child the breast at night; the captain of the ship would allow no other light on board, from the fear of corsairs.

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* *Cocuyo* (Elater noctilucus).

As the breeze freshened, fixing at north-east, we tried to avoid the group of the Caymans, but the current drove us towards those islands. In sailing to S. ¼ S.E., we lost sight of the shore covered with palm-trees, the hills that rise above the town of Trinidad, and the lofty mountains of the island of Cuba. There is something solemn in the aspect of land which you leave, and which sinks by degrees below the horizon of the sea. The interest and seriousness of this impression were augmented at an epoch when Saint Domingo, the center of great political agitations, threatened to involve the other islands in one of those sanguinary struggles which reveal to man the ferocity of his nature. These threats, and these fears, were happily not accomplished; the storm was appeased on the spot which gave it birth, and a free black population, far from troubling the peace of the neighbouring islands, has made some progress towards the softening of manners, and the establishment of good civil institutions. Portorico, Cuba, and Jamaica, with 370,000 whites and 885,000 men of colour, surround Hayti, where a population of 900,000 blacks and mulattoes is accumulated, freed by their own will and the success of their arms. The blacks, more inclined to cultivate alimentary plants than colonial productions, augment with a rapidity only surpassed by the increase of the population of the United States. Will the tranquillity enjoyed in the Spanish and English islands during the twenty-six years which have succeeded the first revolution of Hayti, continue to inspire the whites with that fatal security, which opposes with disdain every amelioration in the state of the captive class? Around that mediterranean of the West Indies, towards the west and towards the south, in Mexico, at Guatimala, and Columbia, new legislations labour with ardour to extinguish slavery. It may be hoped that the union of these imperious circumstances will favor the benevolent intentions of some European governments, who seek to soften progressively the fate of the slaves. The fear of danger will force concessions that are claimed by the eternal principles of justice and humanity.

NOTES

OF

BOOK THE TENTH.

NOTE A.

ONE of the most interesting problems of political economy is the determination of the articles which, in the present state of civilization in Europe, are the principal objects of colonial industry. We may arrive approximatively at exact results, at *limit numbers*, by two different methods: first, by discussing the exportation of the countries that furnish the most considerable quantity of those articles, and which, for sugar, are the West Indies, Brazil, the Guyanas, the isle of France, Bourbon, and the East Indies; secondly, by examining the importation of the colonial articles in Europe, and by comparing their annual consumption with the population, the wealth, and the national habits of each country. When there is one source only for a production, as for instance, for tea, researches of this kind are easy and pretty certain; but the difficulties augment in the tropical regions, which all produce a quantity more or less considerable of sugar, coffee, and indigo. To establish in that case a limit number of the *minimum* of the consumption, we must begin by fixing our attention on the great masses. If we know that the English, Spanish, and French islands, export annually, according to the custom-house registers, 269 millions of kilograms of sugar, it imports little to know if the Dutch and Danish islands produce 18 or 22 millions. If Brazil, Demerara, Berbice, and Essequebo, export 155 millions of kilograms of sugar, a doubt on the production of Surinam and Cayenne which yield together less than 12 millions of kilog., has but little influence on the estimate of the general consumption of Europe. The case is the same with respect to the importation of the sugar of the East Indies to England, on which so many exaggerated notions have been circulated. By neglecting altogether that importation, the error in the actual consumption of Europe, would be only one forty-third; and one of the Little Antilles, for instance, Grenada, Barbadoes, or Saint Vincent's, sends more sugar to Europe than all the English possessions in the East Indies. I have already treated the problem (*Personal Narrative*, vol. iv, p. 241), of which the solution will be discussed in this note; I then thought, from less numerous and less exact materials, that the consumption of sugar in Europe, in the year 1818, amounted only to 450 millions of pounds. This number, even for that epoch, seemed a fifth or a quarter too small; but we must not forget, that from 1818 to 1823, the price of American sugar had lowered 38 per cent., and that the consumption is in the increased ratio of the price. (*Table of Prices in Tooke, Append. to Part* iv, id. 1824, p. 53; and *Statist. Illustr. of the Brit. Emp.*, 1825, p. 56.) In France, for instance, it augmented from 1788 to 1825, more than 40 per cent.; in 1788, it was 21 millions; in 1818, 34 millions; and, in 1825, more than 50 millions of kilograms. It is on account of the rapidity of the increase of colonial produce and the prosperity of Europe, that it becomes important to fix numerically the state of things at a given time. Labors of this kind furnish points of comparison, the importance of which will be sensibly felt by those who, on the traces of Mr. Tooke, would follow in another age the progressive development of the system of industry in both worlds.

I. Production.—We shall here examine the state of agriculture only as it pours its productions into the commerce of Europe and the United States. Considered in this point of view, the archipelago of the West Indies, Brazil, the English and Dutch Guyanas, Louisiana, the isle of France, Bourbon, and the East Indies, are now the sole countries that merit our attention. Mexico exported, by Vera Cruz, annually, from 1802 to 1804, five to five and a half millions of kilograms of sugar; namely:

In 1802.	439,132 arrobas, estimated at	1,476,435 p.
1803.	490,292	1,514,882
1804.	381,509	1,097,505
1810.	121,050	272,362
1811.	101,016	251,040
1812.	12,230	30,575

But the diminution of the price (three piasters the *arroba*, in 1823; and one piaster and three-fifths in 1825), the dearness of transport from Cuernavaca, Puente d'Istla, and Valladolid de Mechoacan, to the port of Vera Cruz, and the political troubles, have caused the entire cessation of the exportation of Mexican sugar. That of Venezuela, Cayenne, Guayaquil, and Peru, belong to the coasting trade, and the exchange of productions which takes place in several parts of Spanish America.

We stated above (vol. vii, p. 172), that the whole archipelago of the West Indies exported, annually, from 1823 to 1825, according to the registers of the custom-house (and in this discussion we first abstracted the product of illicit trade), at least 287 millions of kilograms of sugar, of which three-fourths were raw, and one-fourth refined. The island of Cuba alone, pours into lawful commerce fifty-six millions of kilograms of *azucar blanco y quebrado*. In dividing the 287 millions of kilograms of the whole archipelago, among the Great and Little Antilles, we find the partition nearly equal at a period when, in the island of Hayti, the produce of the cultivation of the sugar-cane scarcely exceeded the interior consumption. Cuba and Jamaica, of which the united surfaces are 4400 square marine leagues, and the number of slaves is 623,500, export altogether 136 millions of kilograms (with the contraband, 150 millions); the Little Antilles being 940 square leagues, with 524,000 slaves, export 144 millions of kilograms.

In comparing the countries which at present pour the most considerable quantity of sugar into the commerce of Europe and the United States, we find them, on a scale of agricultural industry, placed in the following order:

BRAZIL	125 millions k.
(Saint Domingo gave, in 1788, more than 80 millions kil.)	
JAMAICA (area, 460 square m. leagues)	80
CUBA (area, 3615 square leagues), comprehending the illicit trade	70
According to the registers of the custom-house, 56 millions kil.	
ENGLISH GUYANA	31
GUADALOUPE (area, 55 square leagues)	22
MARTINICO (area, 30 square league)	20
ISLE OF FRANCE (area, 108 square leagues)	14
LOUISIANA (doubtful result)	13
BARBADOES OR SAINT VINCENT, each island	12½
Area of the former, 13 s. l.; of the latter, 11 s. l.	
GRENADA and ANTIGUA, each island	11
Area of the former, 15 s. l.; of the latter, 7½ s. l.	
SURINAM	10
EAST INDIES	10

Trinidad (area, 139 square leagues)	9 millions k.
Isle de Bourbon (area, 190 square leagues)	8
Saint Christopher's and Tobago, each island Area, 5 and 12 square leagues.	6
Dominica, Nevis, and Montserrat, each island below	2

YEARS.	IMPORTATION FROM THE ENGLISH ISLANDS TO THE PORTS OF GREAT BRITAIN.	EXPORTATION OF GREAT-BRITAIN.		
		TO IRELAND.	TO DIFFERENT COUNTRIES.	TOTAL OF THE RE-EXPORTATION.
1761	1,517,727 cwt.	130,811 cwt.	444,228 cwt.	575,039 cwt.
1762	1,428,086	100,483	366,327	466,810
1763	1,765,888	159,230	398,407	557,637
1764	1,488,079	125,841	371,453	497,294
1765	1,227,159	152,616	191,756	344,372
Mean annual quantity	1,485,377	133,796	354,434	488,230
1771	1,492,096	207,153	82,563	289,716
1772	1,829,721	189,555	48,678	238,233
1773	1,804,080	200,886	37,323	238,209
1774	2,029,725	224,733	55,481	280,214
1775	2,021,059	272,638	190,568	463,206
Mean annual quantity	1,835,336	218,993	82,922	301,915

YEARS.	IMPORTATION FROM THE ENGLISH ISLANDS TO THE PORTS OF GREAT BRITAIN.	EXPORTATION OF GREAT BRITAIN.		
		TO IRELAND.	TO DIFFERENT COUNTRIES.	TOTAL OF THE RE-EXPORTATION.
1781	1,080,648 cwt.	162,951 cwt.	114,631 cwt.	277,582 cwt.
1782	1,374,269	96,640	49,816	146,456
1783	1,584,275	173,417	177,839	351,256
1784	1,732,386	142,139	222,076	364,215
1785	2,075,909	210,939	223,204	484,143
Mean annual quantity	1,579,537	157,217	157,513	314,730
1791	1,808,950	141,291	267,397	408,688
1792	1,980,973	115,309	508,821	624,130
1793	2,115,308	145,223	360,005	505,228
1794	2,330,026	153,798	792,364	946,162
1795	1,871,368	147,609	551,788	699,397
Mean annual quantity	2,021,325	140,646	496,075	636,721

YEARS.	IMPORTATION FROM THE ENGLISH ISLANDS TO THE PORTS OF GREAT BRITAIN.	EXPORTATION OF GREAT BRITAIN.		
		TO IRELAND.	TO DIFFERENT COUNTRIES.	TOTAL OF THE RE-EXPORTATION
1801	3,729,264 cwt.	113,915 cwt.	862,892 cwt.	976,807 cwt.
1802	4,119,860	179,978	1,747,271	1,927,249
1803	2,925,400	144,646	1,377,867	1,522,513
1804	2,968,590	153,711	762,485	916,196
1805	2,922,255	153,303	808,073	961,376
1806	3,673,037	127,328	791,429	918,757
Mean annual quantity	3,389,734	145,480	1,058,336	1,203,816
1809	3,974,185	272,943	1,223,748	1,496,691
1810	4,759,423	102,039	1,217,310	1,319,349
1811	3,897,221	335,468	355,602	690,870
Mean annual quantity	4,210,276	236,816	932,220	1,168,970

It must be observed that the English quintal, or *cwt.*, is equal to fifty kilograms and four-fifths. The preceding table was framed in the *Office of the Inspector-general of the Custom-house*, in London, under the direction of Mr. William Irwing. From 1812 to 1815, the exportation of the English islands, of Demerara, Berbice, and the Essequebo, were:

In 1812	3,551,449 cwt.
1813	3,500,000
1814	3,408,793
1815	3,493,116

The English Guyanas furnished to trade, at that period, only 340,000 cwt. yearly. (*Stat. Illustr.*, p. 56.) The following table, taken from the *Parliamentary Returns*, comprehends the exportation of the sugar of the West Indies and Guyana, to the different ports of Great Britain, in the years 1816-1824.

ENGLISH ISLANDS.	SLAVES IN 1823.	1816. (cwt.)	1817. (cwt.)	1818. (cwt.)	1819. (cwt.)	1820. (cwt.)	1821. (cwt.)	1822. (cwt.)	1823. (cwt.)	1824. (cwt.)	Mean exportation of 1816 to 1824. (cwt.)
Jamaica	342,382	1,389,411	1,717,259	1,653.303	1,614,346	1,769,124	1,679,720	1,413,717	1,417,746	1,451,332	1,567,328
Antigua......	30,985	197,300	179,370	228,308	209,395	162,573	207,548	102,938	135,466	222,207	182,789
Barbadoes ...	73,345	288,623	239,732	249,076	282,456	179,951	211,371	156,682	314,630	245,828	240,928
Dominica .. .	16,554	47,035	31,678	33,820	42,896	45,932	38,119	41,650	39,013	42,329	40,275
Grenada	25,580	266,055	196,959	220,958	204,565	184,551	216,367	199,178	247,369	227,613	218,180
Monserrat ...	6,593	28,981	31,214	36,919	37,168	32,815	33,282	27,071	24,466	30,648	31,396
Nevis........	9,261	71,655	45,852	82,368	63,154	36,395	66,023	31,696	44,283	40,734	53,573
S. Christoph..	19,817	124,757	125,977	130,218	141,501	89,501	128,436	89,682	76,181	132,585	115,426
St. Lucie	13,794	69,830	56,401	42,006	78,719	50,220	77,971	92,060	62,148	73,100	66,939
St. Vincent ..	24,252	263,433	242,413	254,446	262,033	216,679	233,448	261,159	232,575	246,821	245,890
Tobago	14,314	139,157	132,387	112,930	132,544	109,194	108,243	100,725	113,015	123,868	119,118
Tortola	6,460	51,092	42,934	43,573	36,421	15,225	23,459	22,170	21,583	20,559	30,780
Trinidad	23,537	132,893	128,433	138,153	166,591	156,041	162,257	178,491	186,891	180,093	158,872
Total of English islands	606,876	3,070,222	3,170,609	3,226,078	3,271,789	3,048,201	3,186,244	2,717,219	2,915,366	3,037,717	3,071,494
GUYANA.	SLAVES IN 1823.	1816. (cwt.)	1817. (cwt.)	1818. (cwt.)	1819. (cwt.)	1820. (cwt.)	1821. (cwt.)	1822. (cwt.)	1823. (cwt.)	1824. (cwt.)	Mean exportation (cwt.)
Demerara....	77,370	323,443	377,796	420,186	480,933	536,561	492,146	530,948	607,858	613,990	487,095
Berbice	23,356	15,308	14,158	17,764	29,967	37,696	53,257	55,357	55,995	64,608	38,235
Total of English Guyana	100,726	338,751	391,954	437,950	510,900	574,257	545,403	586,305	663,853	678,598	525,330

The exportation for the ports of Ireland is not comprised in this table: it was, according to the information kindly communicated to me by Mr. Charles Ellis (now Lord Seaford):

1821, from Jamaica 21,785 cwt.; the other English islands 123,037 cwt.; from English Guyana 24,843 cwt.
1822, from Jamaica 15,715 cwt.; the other English islands 93,406 cwt.; from English Guyana 22,327 cwt.
1823, from Jamaica 28,490 cwt.; the other English islands 149,994 cwt.; from English Guyana 21,605 cwt.
1824, from Jamaica 30,472 cwt.; the other English islands 155,197 cwt.; from English Guyana 31,508 cwt.

We see, from the whole of these statements, that the production has nearly doubled at Demerara and Berbice, from 1816 to 1820; that that of Jamaica has, of late years, diminished nearly one-eighth; but, that the increase of the production in several of the Little Antilles, especially at Trinidad, Antigua, and Saint Lucia, has rendered this diminution less sensible for the commerce of Great Britain.

Brazil which, in years of great drought, furnishes an exportation of only 90 millions of kilograms, has risen, in 1816, according to the researches of the Baron De Lessert, to 130 millions.

Louisiana (with more than 75,000 slaves), probably now exports nearly 13 millions of kilograms of sugar. Mr. Pitkin estimated the production in 1810, at five millions of kilograms; but it is asserted, that in 1815, the total quantity amounted to 40,000 *boucauts* (at 1000 pounds a-piece).

The English and Dutch *Guyanas* may be estimated together, at an exportation of 40 millions of kilograms. The colony of Surinam alone, gave:

1820	18,086,000 pounds.
1821	18,549,000
1822	17,964,000
1825	20,266,000

In the isles of France and Bourbon, the cultivation of the sugar-cane has made a remarkable progress. If it be admitted, that in the latter island, it has only become of some importance since 1814, the exportation of the sugar of the isle of Bourbon has been already—

In 1820 to	4,541,000 kilog.
1821	4,926,000
1822	6,995,000
1823	5,608,800

I owe these official statements to the Count des Bassayns de Richmond, formerly intendant of the colony. The harvest of 1823 was diminished by a hurricane which took place on the 24th of February of that year. According to the report of the directing commissary, it was believed that the production of 1825 might amount to eight millions of kilograms; but we must not forget that the administration tends to exaggerate the wealth of the island, in order to justify the increase of taxes, while the consulting committee is disposed to make the revenues of the colony appear to be less considerable, to prove that they are not in proportion with the burdens. M. Rodet, in his excellent work on the *External Commerce of France, and the question of an Entrepôt at Paris* (1825, p. 150), carries the exportation of the sugar of Bourbon to the mother country, in the four years 1820-1823, only to 13,503,000 kilog. Sir Robert Farquhar, formerly governor of the isle of France, saw the exportation of that colony, which, in 1820, was eight millions of pounds, rise to 15 millions in 1821, and to 25 millions in 1822. It is now believed to exceed 30 millions of pounds. The sugar of the isle of France and of the East Indies, were comprised in the tables of the English custom-house, under the same denomination; and the greatest importation of sugar from the East Indies to all the ports of Great Britain, having been only 14 millions of kilograms before 1822 (the quantity that corresponds to the year 1820), it is probable that the exportation of the three Presidencies of India, did not surpass, in the year 1820, nine or ten millions of kilograms. Besides, neither all the sugar of India, nor of the isle of France, flows into the ports of Great Britain. According to the reports made from 1814 to 1821, on the state of external commerce at Calcutta and Bombay, these ports, during seven years, exported sugar from the East Indies, to the total value of 24,411,000 rupees, of which 10½ millions were for England, two millions for the rest of Europe, and 5½ millions for the United States. The exportation of the three Presidencies to the ports of Great Britain, which was to the value of 1,139,400 rupees, in 1815, rose in 1821, to 2,097,800 rupees. (*On Protection to West India Sugar*, 1823, p. 154.)

II. Consumption.—The production of sugar, or rather the quantity exported and registered in America, at the isles of France and Bourbon, and in the East Indies, for Europe and the United States, may be determined with sufficient precision; but it is much more difficult to estimate the distribution of this mass among the different nations. We shall soon see that this consumption is only known with some certainty in Great Britain, France, and the United States; three countries which together consume 230 millions of kilograms: the statistical notions collected on the German States, Holland, and Italy, furnish statements that are little satisfactory, the re-exportations being partly confounded with the internal consumption, and the complication of the frontiers augmenting the effects of fraudulent trade. In comparing the population, the well-being, and the habits of the English and French nations with the same elements of calculation in the rest of Europe, it is difficult to conceive where that prodigious quantity of sugar (495 millions of kilograms, or 9,744,000 cwt.) exported annually from the ports of the West Indies, Brazil, the Guyanas, the American islands, and the peninsula of India, is employed.

The internal consumption of *Great Britain* is at present 142 millions of kilograms; it was even twice, in 1810 and 1811, 182,321,000 kilograms, and 163,932,000 kilograms. It has increased since the end of the seventeenth century, in the following progression:

MEAN YEAR.		
From 1690 to 1699.	200,000 cwt. or	10,160,000 kil.
1701 to 1705.	260,000	13,208,000
1771 to 1775.	1,520,000	77,216,000
1786 to 1790.	1,640,000	83,312,000
1818 to 1822.	2,577,000	130,912,000

The consumption of sugar has consequently augmented nearly thirteen times in 124 years (*Report of a Committee of the Liverpool East India Association*, 1822, p. 41. *Stat. Illustr.*, p. 57), while the population has more than doubled. The latter was, in 1700, in England, 5,475,000; in Ireland, twelve years later, 2,099,000; and in Scotland, in 1700, probably 1½ million. Total of the united kingdoms, in 1700, nearly nine millions; and in 1822, more than 21,200,000 souls. In computing the consumption of sugar in the whole British islands (Great Britain and Ireland), we find, mean year:

From 1761 to 1765.	1,130,943 cwt. or	57,452,000 kil.
1771 to 1775.	1,752,414	89,023,000

In this table, the total re-exportation in raw sugar, is estimated on the principle that 34 cwt. of raw sugar yields 20 cwt. of refined sugar. The registers of the London custom-house were destroyed by fire, in 1813; and the numbers indicated for that year are taken from the *Statist. Illustr.*, published in 1825 (p. 56-57). Compare *Thoughts on High and Low Prices*, 1824, *Appendix*, iv, p. 72.

The importation of Great Britain, in 1823, was 4,012,144 cwt., or 203,817,000 kilograms, and the interior consumption 2,807,756 cwt., or 142,634,000 kilograms. When Mr. Huskisson, in an excellent parliamentary discourse (pronounced in March 1824), estimated the consumption at 3,000,130 cwt., or 152,406,000 kilograms, he meant, no doubt, the total consumption of the united kingdoms. We must not fail to remark also, that the quantity of sugar, indicated as *home consumption* in the official tables, is only the difference of the quantities imported and exported, without including the sugar that remains every year accumulated in the stores. The mean value of the imported quantity, variable according to the current price and the activity of trade, amounted (from 1813 to 1815) to 10 or 12 millions sterling. This value has in these latter years, from 1820 to 1823, been only six millions sterling. It results that the partial consumption of East India sugar in Great Britain rose in

1808 to	23,526 cwt.
1809	9,313
1810	42,145
1820	90,625
1821	121,859
1822	124,009

It has consequently almost sextupled in twelve years. (*See* also, *On Protection of West India Sugar*, 1823, p. 9, 148.)

The produce of the West Indies alone amply suffices at present for the wants of the population of Great Britain : now, that population forms only seven-hundredths of the whole European population, while the consumption of sugar in Great Britain is nearly thirty-hundredths of all the sugar imported into Europe.

France, in 1788, consumed but the fifth (at most the fourth) of the sugar of its colonies. M. Peuchet (*Stat. élém. de la France*, p. 406) estimates the consumption of the kingdom to have been at that period 21,266,000 kilograms of refined sugar. According to M. Chaptal, it was only, in 1801, 25,220,000 kilograms; but, from 1816 to 1821, France received in kilograms, according to the statement of the custom-house :

YEARS.	SUGAR OF THE FRENCH COLONIES.	SUGAR FROM FOREIGN PARTS.	TOTAL.
1816	17,530,000	7,049,000	24,579,000
1817	31,102,000	5,443,000	36,545,000
1818	29,809,000	6,277,000	36,086,000
1819	34,360,000	5,400,000	39,760,000
1820	40,752,000	8,467,000	49,219,000
1821	41,702,000	2,649,000	44,351,000

This gives, mean year, an importation of 32,542,000 kilograms of sugar of the French colonies, and 5,881,000 kilograms of foreign sugar: total, 38,423,000 kilograms. In fixing on the results of the last four years, from 1820 to 1825, we find a mean importation, in France, of 48,019,636 kilograms of sugar, of which 40,367,452 kilog. were from the French islands and Cayenne, 3,375,888 from the isle of Bourbon, and 4,276,296 from India, Brazil, and the Havannah. Of these 48,019,636 kilograms, 1,123,158 kilograms of refined sugar are re-exported, mean year, and 3,707,507 kilograms of molasses; the annual consumption of France was therefore, from 1820 to 1822, nearly 44 millions of kilograms. (*Rodet, du Commerce extérieur,* p. 154.) The quantity of sugar imported into France in the last four years has been, from the notes communicated to me by the Count Saint Cricq, president to the board of trade:

In 1822	55,481,004 kilog.
1823	41,542,856
1824	60,031,122
1825	56,081,506

In 1825, were re-exported, 3,264,734 kilograms of refined sugar, and 4,856,775 kilograms of molasses; so that including the sugar contained in the molasses, the interior consumption of France was more than 51 millions of raw sugar. The consumption in France and England augmented, from 1788 to 1825, in the relation of 10 : 24·4 and 10 : 17·3; but from 1819 to 1825, the increase has been much more rapid in France; the consumption has risen from 39,800,000 kilograms, to 51 millions of kilograms.

The mean of three years 1800, 1801, 1812, in the *United States*, furnishes, according to the information which I owe to the friendship of M. Gallatin: importation, in sugar and cassonade, 116,644,000 pounds; re-exportation, 71,676,000; which gives a consumption of 44,968,000 pounds. (*Poli-*

tical Essay, vol. iv, p. 314, &c.) M. Pitkin (*Statistical View,* 1816, p. 249) estimates this consumption, in 1815, at 70 millions of English pounds, or 31,500,000 kilograms. Yet, from the registers of the custom-house, the mean of ten years (1803-1812) give M. Seybert (*Annales Statist.,* 1820, p. 129) only 120,613,130 pounds of imported sugar, and 66,243,660 pounds of re-exported; thence results a mean consumption for the beginning of the nineteenth century, of 54,369,470 pounds. The molasses, of which the annual consumption was at that period 7,355,000 quarts, was not comprised in this estimate. From 1821 to 1825, the exportation of sugar to the United States has been, mean year, 75 millions of pounds, of which 4,300,000 pounds were from the East Indies, and the isles of France and Bourbon. The re-exportation at that period, was annually 18 millions of pounds; the consumption therefore amounted to 57 millions of pounds of East and West India sugar, 15 millions of pounds of Louisiana sugar, and eight millions of pounds of maple sugar; total, 36 millions of kilograms.

In comparing the population of the island of Cuba, Great Britain, the United States, and France, with the quantity of raw sugar consumed annually in these different countries, we find a remarkable descending progression, according to the degrees of ease, and above all, according to the national habits.

COUNTRY.	ANNUAL CONSUMPTION IN KILOG. OF RAW SUGAR.	FREE POPULATION.	ANNUAL CONSUMPTION OF SUGAR PER HEAD.
Island of Cuba	11 millions	450,000	$24\frac{2}{5}$ kilogr.
Great Britain	142 millions	14,500,000	$9\frac{4}{5}$ kilogr.
United States of America	36 millions	9,400,000	$3\frac{4}{5}$ kilogr.
France	52 millions	30,600,000	$1\frac{4}{5}$ kilogr.

I have already mentioned (vol. vii, p. 166) the immense consumption of sugar in the tropical parts of America, inhabited by nations of Spanish race. I fixed on the quotient given by the number of free men only. The negroes, however, consume also raw sugar in the work-shops, during the fabrication. The notions on Ireland not being sufficiently precise, I have only given in the preceding table, the consumption of Great Britain, now estimated approximatively, at 2,800,000 cwt. According to the direct importations of Ireland, which were stated above, it may be supposed that that country, with a very poor population of 6,800,000 inhabitants, does not consume more than 12 millions of kilograms annually, which makes one kilog. four-fifths per head. The consumption of the United States, in 1825, reduced to the total free and slave population (probably, 11,138,000), would yield three kilograms and one-fifth per head, or a third more than in France. The estimate made by M. Pitkin (31½ millions of kilograms for the year 1825), was no doubt too high: it would give four kilog. and three-fifths, for the free population of 6,983,000 which existed at that period.

The relative consumption of the island of Cuba, Great Britain, France, and the United States, is at present nearly in the relation of the numbers,

13·6. 5·4. 2·1. 1.

If we suppose the consumption of the United States (Great Britain with Ireland) to be 15½ millions of kilograms, which is less certain, we find for the total population of 21,300,000 inhabitants, enjoying very unequal ease, seven kilog. one-fifth per head.

To add to these accurate statements on the United States, Great Britain, and France, some conjectures respecting the consumption in other parts of our continent, we shall first recapitulate the total mass of sugar thrown annually into trade:

	millions k.
ARCHIPELAGO OF THE WEST INDIES	287

	millions k.
ENGLISH ISLANDS	165

We estimated above, the mean exportation of Jamaica, from 1816 to 1824, for the ports of Great Britain and Ireland (exportation which must not be confounded with the production), at 1,597,000 cwt., or 81,127,000 kilog. That of the rest of the English islands, at 1,634,000 cwt., or 83,007,000; total, 3,231,000 cwt., or more than 164 millions of kilograms. In fixing on the last five years (1820-1824), we should find, according to the same official statements, for Jamaica, common year, 1,573,000 cwt., or 79,908,000 kilograms; and for the other English islands, 1,564,000 cwt., or 79,451,000 kilograms; total, 159,359,000 kilog. The difference, according as the mean is taken from 1816 or 1820, is therefore only 4½ millions of kilog., or 88,500 cwt., a much less quantity than the variations which the exportation of Jamaica sugar for Europe undergoes in two subsequent years. In classing the English islands according to the quantity of sugar which they now throw into trade, we shall obtain the following order: Jamaica; Saint Vincent's and Barbadoes, nearly equality of production; Grenada, Antigua, Trinidad, Tobago, Saint Christopher's, Saint Lucia, Dominica, Nevis, Montserrat, Tortola.

millions k.

SPANISH ISLANDS 62

In this table we have fixed on the quantities registered; the exportation of Cuba only, with the contraband, is more than 70 millions of kilograms.

millions k.

FRENCH ISLANDS 42

The slave population of the French and Spanish islands, is exactly in the same relation as the exportation of sugar; which proves the great fertility of the soil of the island of Cuba; for nearly a third of the slaves in that island inhabit the great towns. (Vol. vii, p. 113.

millions k.

DUTCH, DANISH, AND SWEDISH ISLANDS.......... 18

millions k.

287

millions k.
BRAZIL.. 125

In 1816, the exportation was 5,200,000 kilograms greater; but we have already observed, that in years of great drought, the exportation diminishes as far as 91 millions of kilograms.

millions k.
ENGLISH, DUTCH, AND FRENCH GUYANAS 40

In fixing on the last five years (1820-1825), the exportation of Demerara, Essequebo, and Berbice, or English Guyana, was 30,937,000 kilograms. We see that the cultivation of that part of Guyana augments in proportion as that of the English islands tends to decrease. The mean, from 1816 to 1824, gave, for English Guyana, 525,000 cwt., or 26½ millions of kilograms, which denotes an annual increase of exportation of 4½ millions of kilograms, or one-eighth; while the English islands have diminished, according to the comparison of the mean, from 1816 to 1824, and from 1814 to 1824, 4½ millions of kilograms, or one thirty-fifth.

millions k.
LOUISIANA.. 13

millions k.
EAST INDIES, ISLES OF FRANCE AND BOURBON.. 30

Isle of France, 12 millions kilog.; East Indies, at most 10 millions kilog.; Bourbon, 8 millions kilograms. The exportations for the United States are joined, as every where in this table, to those for Europe. If the East Indies were to replace the English West Indies, their exportation in sugar must be 16 times greater.

millions k.
Total.................................. 495

I have indicated minutely the sources from which the elements of the general table are drawn; researches of this kind have little value without the indication of the documents employed: the reader should be enabled to examine the partial statements. The only remaining doubt at present is on small quantities (for instance, on the exportations of Portorico, Curaçoa, Saint Thomas), or on the unequal production of sugar at Brazil. In estimating these oscillations, or the whole of the uncertainties which remain, at 35 millions of kilograms, the sum total of the exportation still varies but one-fourteenth. If we deduct 38 millions of kilograms for the consumption of the United States and Canada, there remain 457 millions of kilograms of sugar (of which seven-eighths are raw and one-eighth refined) for the annual importation to Europe. It is a *limit number* at *minimum:* for the elements of these calculations are all drawn from the registers of the custom-houses, without adding any thing for the product of fraudulent trade. In dividing the mass of raw sugar consumed in Europe by the number of the inhabitants (208½ millions), we find two and one-fifth kilograms per head; but this result is only a sterile arithmetical abstraction, which leads as little to useful considerations as the attempt to distribute the population of the cultivated regions of the United States or of Russia on the total area of 174,000 and 616,000 square marine leagues. Europe reckons fifty-five-hundredths, or 106 millions of inhabitants who, accumulated in the British Empire, the Low Countries, France, Germany properly so called, Switzerland, and Italy, consume an immense quantity of sugar; and thirty-three hundredths or 75 millions dispersed in Russia, Poland, Bohemia, Moravia, and Hungary, countries where the indigence of the majority of the inhabitants renders the consumption extremely small. These are the extreme points of the scale, with respect to luxury and the factitious wants of society. In order to appreciate the ease of the population of Germany, I shall here mention that the port of Hamburg only, imported in 1821, near 45 millions of kilograms of sugar; while in 1824, the importation was 44,800 cases, or 29,120,000 kilog. from Brazil; 23,800 cases, or 4,379,000 kilog. from the Havannah, and 10,600 barrels, or 8,480,000 kilog. from London; total 41,979,000 kilograms. In 1825, was imported: 31,920 cases, or 20,748,000 kilog. from Brazil; 42,255 cases, or 7,774,900 kilog. from the Havannah, and 20,506 barrels, or 16,404,800 kilog. from England; total 44,927,000 kilograms. The importation of Hamburg was, consequently, but one-sixth lower in 1825, than that of the whole of France. The port of Bremen imported, in 1825, near five millions of kilograms; that of Antwerp, in the same year, 10,758,000 kilograms. In the south of Germany, where the consumption of sugar is also very considerable, the complication of transit and contraband, render the statistic researches very difficult. How can we admit, for instance, with M. Memminger, that, in the kingdom of Wurtemberg, which is in great prosperity, 1,446,000 inhabitants consume only 980,000 kilograms of sugar yearly?

In deducting the 457 millions of kilograms of raw sugar imported into Europe, 204½ millions for the consumption of France and the three United Kingdoms, and supposing two kilograms per head (which is a great deal) for the population of 76 millions in the Low Countries, Germany properly so called, Switzerland, Italy, the Iberian peninsula, Denmark, and Sweden, there remains nearly 100¾ millions kilograms for Asia Minor, the coast of Barbary, the western governments of Siberia and of Europe inhabited by the nations of Sclavonian, Hungarian, and Turkish race. Now, the population of Morocco, Algiers, Tunis, and Tripoli, are pretty considerable, amounting to a total of 24 millions. Asia Minor has four millions; and we may suppose without exaggeration, for the coast of Africa, Asia Minor, and Syria, counting only the coast, covered with large commercial towns, an exportation of 10 millions of kilograms of raw sugar. From these statements, it must be concluded that the 80 millions of inhabitants of Sclavonian, Madjare, and Turkish Europe (Russia, Poland, Bohemia, Moravia, Hungary, and Turkey), consume thirteen-hundredths per head. This result appears surprising, if we compare the actual state of the civilization of those countries with that of France. We should expect a much less consumption; and yet the estimate of the sugar exported from America and the East Indies for Europe and the United States, far from being exaggerated, is probably below the reality. If the fraud of the custom-houses renders the consumption of Great Britain and France (two countries which have served as a type in the preceding reasonings) more considerable than we suppose, if we admit that the French and English consume still more than one and four-fifths and nine and four-fifths kilog. per head, we must not forget that the same cause of error acts on the estimate of the exportations in America and the East Indies. In the year 1810, when Great Britain consumed nearly 177½ millions of kilograms, the quotient was twelve and one-fifth kilograms per head. It were to be wished, that a writer who had the habit of precision in numerical researches, and could draw his materials from good sources, would treat, in a separate work, the important problem of the European consumption of sugar, coffee, tea, and cocoa, at a given time. Such a work would require several years; for many of the documents are not printed, and could only be obtained by an active correspondence with some of the great commercial houses of Europe. I could not devote myself to these researches in all their extent. The time approaches when colonial articles will be for the most part the produce, not of colonies, but of independent countries; not of islands, but of the great continents of America and Asia. The history of the commerce of nations is wanting in numerical statements which relate to the position of the whole, and this void can only be filled up when at a period menacing the world of industry with great revolutions, some one will have the courage to collect the scattered materials, and submit them to a severe criticism.

I shall terminate these researches by comparing the productions of the sugar of the cane, of the sugar of beetroot, and of wheat, within the tropics, and in the middle region of Europe. At the island of Cuba, the hectare yields 1330 kilograms of refined sugar; value, on the spot of production, 870 francs, counting the price of the case of sugar (or 184 kilograms) at 24 piasters. (Vol. vii, p. 204, &c.) The price of land is regarded as very high at the Havannah and Matanzas, when a *caballeria* costs 2500 to 3000 piasters; it is, however, but rarely 1000 francs the hectare. In the vicinity of Paris, the price of land rises to 2500 and 3000 francs. Land of middling fertility yields 500 kilograms of raw sugar of beetroot per hectare, value 450 francs: but it is affirmed that in very fertile soils, in la Beauce and la Brie, the hectare gives more than 1200 kilograms. Supposing, in France, an octuple harvest, a hectare of land produces 1600 kilograms of wheat, value 288 francs, reckoning the 100 kilograms of wheat at 16 to 20 francs. Lavoisier estimated the kilogram of wheat four sous, which makes 20 francs the 100 kilograms. A hectare yields consequently, within nearly one-fifth, the same weight in the West Indies in cane-sugar, as in the temperate zone in wheat. The amylaceous grains of a cereal weigh, by the hectare, but 270 kilograms more than crystallized sugar drawn from the knots of the sugar-cane within the tropics. Every individual consumes, in the totality of France, 1½ to 1¾ pounds of bread per day, or 200 kilog. of wheat in a year. Lavoisier reckoned 11,667 millions of pounds weight of wheat, rye, and barley, for a population of 24,676,000 (*Peuchet*, *Stat. de la France*, p. 286), which makes annually about 230 kilograms per head. The consumption of bread at Paris, is only 168 kilograms a year. (*Chabrol de Volvic, Rech. Stat.*, 1823, p. 73.) In France the consumption per head is 125 times, and in England scarcely 23 times, more of wheat than sugar. The expence of bread at Paris is estimated at more than 38 millions of francs; while the annual expence of sugar, of which a great part however is re-exported to the departments, amounts to 27 millions of francs (*Budget et Comptes de la ville de Paris pour* 1825, p. 16).

I marked above the produce of the cultivation of beetroot, such as it was estimated in the vicinity of Paris, and according to the processes employed four or five years past. As this cultivation continues to excite the greatest curiosity in the West Indies, I shall here relate the more recent statements of M. de Beaujeu, in a very interesting memoir presented to the Academy of Science, in the month of August, 1826. That great agriculturist has kindly given me an extract of his memoir; and, as the results he obtains are much greater than those of the more ancient methods, I shall here transcribe them:

"Considering in general the cultivation of the sugar of beetroot, above all, of the *yellow variety*, in those parts of France particularly fitted for it, such as la Beauce, la Brie, part of Normandy, and the plains of the north of the kingdom, I shall estimate, says M. de Beaujeu, the ordinary produce of a hectare at 30,000 kilograms * from the result of my own experience. In countries less fertile, 20,000 kilograms is an estimate high enough. This *yellow variety* of beetroot ought to yield at most five, at least four per cent. raw, *including that which is furnished by reboiling the molasses*. Now, computing *in the fertile parts of France*,

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* Compare above, vol. vii, p. 204, &c.

30,000 kilograms of roots per hectare, those roots, well scraped and worked, in a favourable season, will produce 1200 to 1500 kilograms of raw sugar; and 750 kilograms of refined sugar in loaves; 450 kilograms of verjuice, and 300 kilograms of molasses, fit to yield brandy; which makes 50 per cent. of loaf-sugar, 30 per cent. of verjuice, and 20 per cent. of molasses. We may calculate on a mean of 1000 to 1200 kilograms of raw sugar per hectare, in the state of improvement which the art of fabrication of native sugar has attained."

"The beetroot, produced by a fertile soil which furnishes 30,000 kilog. the hectare, should yield 75 per cent. * of expressed juice, and there then remains five and one-third to six and two-thirds per cent. of raw sugar of the juice of beetroot, including what is obtained from the reboiling of the molasses, become very advantageous from the improvement of the fabrication of syrup. There does not exist in France, to my knowledge, in 1826, more than thirty establishments for making sugar of beetroot, which can make at the utmost 500,000 kilog. of raw sugar of different qualities; but the greater part of these establishments are far from giving 50 per cent. for loaf-sugar. In the year 1812, it was computed that there existed 200 establishments, which should furnish a million of kilog. of raw sugar; but many of these could only succeed in making syrups or molasses, of the worst quality, and of which it was difficult to make any use. It is easy to obtain a good harvest of beetroot in fertile soils, every three years: I have long tried one every two years, where the soil is best appropriated to that cultivation. If the actual consumption of France was 56 millions of kilograms of raw sugar, it would require but 168,000 hectares of good land, of which one-third, or 56,000 hectares cultivated every year in beetroot, to furnish the sugar necessary for the whole kingdom."

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* Vol. vii, p. 204, note.

METEOROLGICAL OBSERVATIONS MADE AT THE BOTANIC GARDEN OF THE HAVANNAH, IN 1825, BY DON RAMON DE LA SAGRA, PROFESSOR OF NATURAL HISTORY.

MONTHS.	BAROMETER.						THERMOMETER.			HYGROMETER.			DIRECTION OF THE WINDS.
	MAX.		MIN.		MEAN.		MAX.	MIN.	MEAN.	MAX.	MIN.	MEAN.	
	in.	li.	in.	li.	in.	li.							
January . . .	28	5·5	27	11·8	28	1·8	26·5°	15 0°	21·42°	97·0°	69·0°	73·29°	E. and E.N.E., 8. S.S.E. and S.W., 19. N.N.E. and N.W., 12.
February . .	28	·5	27	11·5	28	4·5	26·5	15·0	22·85	95·0	70·0	80·45	S.W., S., and S.E., 38. N.E., N. and N.W., 21. E. and E.N.E., 15.
March	28	1·9	27	9·3	27	11·92	29·5	19·0	23·72	98·0	73·2	88·47	S. and S.E., 65. N. and N.E., 12. E. and E.N.E., 10.
April	28	2·5	27	10·0	28	1·32	30·2	19·0	24·15	98·0	66·0	84·94	S. and S.E., 34. N. and N.W., 15. E. and E.S.E., 23.
May	28	1·5	28	0·1	28	1·09	30·2	21·9	25·06	97·9	75·2	83·54	S. and S.E., 17. N.E., 12. E. and E.S.E., 18.
June	28	2.1	27	10·3	28	0·45	31·0	23·0	28·12	96·0	77·3	87·41	S. and S.E., 33. N.E. and N.N.E., 16 E., E.S.E, and E.N.E., 21.
July	28	2·8	28	0·2	28	1·79	31·7	20·0	28·22	96·0	71·8	85·19	S.W. and S.S.E., 37. N.E., 11. E. and E.S.E., 22.
August	28	1·7	28	0·0	28	1·42	31·6	21·0	. . . .	96·2	78·0	86·98	S. and S.E., 40. N.E., 18. E. and E.S.E., 23.
September. .	28	0·7	27	10·5	27	11·31	31·4	23·9	28·52	96·0	82·1	88·65	S. and S.E., 48. N.E. and N.W., 22. E. and E.N.E., 5.
Otober	28	1·8	27	7·5	28	0·24	30·4	24·1	27·35	99·0	81·0	90·42	S. and S.E., 22. N.E. and N.W., 45. E. and E.N.E., 16.
November. .	28	2·9	27	11·8	28	1·24	27·8	19·0	23·54	99·0	75·0	87·26	S. and S.E., 32. N.E., 19. N N.E. and E.S.E., 22.
December. .	28	4·9	28	0·3	28	2·45	28·0	15·4	21·62	99·0	71·0	84·24	S., S.E., and S.W., 26. N., N.E., and N.W., 44. E. and N.N.E., 14.
Mean of the year	in. 28	li. 5·5	in. 27	li. 7·5	in. 28	li. 1·05	31·7°	15·0°	24·9°	99·0°	66·0°	85·45°	S.W., S., S.S.E., and S.E., 407. N.E., N., and N.W., 259. E.N.E., E., and E.S.E., 197.

January, seven days of rain. *February*, nine days of rain. The barometer attained its highest elevation in this and the two preceding months. *March*, violent showers during seven days; hail. *April* and *May*, little rain. *June*, eight days of rain. *July*, the beginning of the southern tempest; storms; eight days of rain. *August*, great calm, the wind S. and S.E.; seven days of rain. *September*, calms that precede gales (*chubascos*) of south wind; great heat; thirteen days of rain. *October*, violent showers, and a sky that announced the hurricane from which Trinidad and Cuba suffered greatly, the 1st October. The same day an extraordinary lowering of the barometer. *November*, little rain; great clouds on the south and south-west. *December*, the N. and N.W. winds predominate; some gales of wind; the sky covered and foggy. Through the whole year, seventy-five days of rain. In comparing this year only, the observations of the temperature of the Havannah, with the mean of Ferrer (vol. vii, p. 86), we find:

Mean annual temperature in 1825, 24·9°; from 1810 to 1812, 25·7°.
Mean temperature of the hottest month, 28·5°; 28·8°.
Mean temperature of the coldest month, 21·4°; 21·1°.

The instruments were compared with those of the Royal Observatory of Paris. The *barometer* is divided into inches and lines (old French division). The *thermometer* is centesimal. The *hygrometer* is of hair, of the construction of Saussure. The figures added to the direction of the winds indicate, not the duration, but how many times the wind blew from such or such a rumb. The mean is drawn from the whole of the observations made three times a day. The hoary variations of the barometer were $0{\cdot}7^{ll}$ to $1{\cdot}7^{ll}$.

OF THE TEMPERATURE OF DIFFERENT PARTS OF THE TORRID ZONE AT THE LEVEL OF THE SEA.

The exact knowledge of the climate of the Havannah and Rio Janeiro, situated within the tropics of Cancer and Capricorn, complete the notions we have acquired on the mean temperature of different parts of the equinoxial region. That region furnishes, no doubt, the *maximum* of mean annual heat at the equator; but the heat decreases almost insensibly from the equator to 10° of latitude, and with much greater rapidity from the parallel 15° to that of 23°. The traveller, in going from the equator towards the tropics, is less struck by the decrease of the mean annual temperature, than by the unequal distribution of heat in different parts of the year. It cannot be doubted that the numerical elements of tropical Climatology are yet far from being determined with equal precision; we should labor to improve them; but even in the actual state of that science, certain limits of error may be assigned to those elements, which it is not probable will be surpassed by new observations. We have recognised above (vol. vii, p. 81), that the mean temperature of the Havannah, Macoa, and Rio Janeiro, three places situated at the level of the sea, and at the extremity of the equatorial zone, in the two hemispheres, are 25·7°; 23·3°; 23·5° cent., and that these differences arise from the unequal distribution of the neighbouring lands and seas. What degree of temperature should be admitted for the equator? This question was recently agitated in a memoir published by Mr. Atkinson, in the second volume of the *Memoirs of the Astronomical Society of London* (p. 137-183), and which contains very judicious considerations on several important points of Meteorology. The learned author attempts to deduce from my own observations, and by employing the most rigid rules of calculation, that the mean temperature of the equator is, at least, 29·2° of the centigrade thermometer (84·5° F.), and not 27·5° (81·5° F.), as I had supposed in my *Essay on the isotherme lines*. Kirwan fixed on 28·8°; M. Brewster, in his Climateric Formules, at 28·2°. (*Edinb. Journal of Science*, 1829, No. 7, p. 180.)

If the question in this discussion were the mean temperature of an equatorial band surrounding the whole globe, and limited by the parallel of 3° N. and 3° S., we ought first to examine the temperature of the equatorial ocean; for there is only one-fifth of the circumference of the globe which, in this zone, belongs to the main land. Now, the mean temperature of the ocean,, in the limits we have reckoned, oscillates in general between 26·8° and 28°. I say in general, for we sometimes find the limits of the *maxima* restrained to zones that have scarcely the breadth of a degree, and of which the temperature rises, in different longitudes, to 28·7° and 29·3°. I observed this latter temperature, which may be considered as extremely high in the Pacific Ocean, on the east of the isles Galapagos, and the Baron Dirckinck de Holmfeldt, a very well informed officer of the Danish marine, who has made a great number of thermometric observations at my request, found recently (lat. 2·5° N.; long. 81° 54′ W.), almost on the parallel of the Punta Guascama, the surface of the water at 30·6°. These *maxima* do not belong to the equator itself; but are found sometimes north, sometimes south of the equator, and often between 2½° and 6° of latitude. The great circle which passes by the points where the waters of the sea are hottest, cuts the equator under an angle which seems to vary with the declination of the sun. Travellers have passed several times, on the Atlantic Ocean, from the northern temperate zone to the southern temperate zone, without having seen the centigrade thermometer rise above 28° *in the band of the hottest waters*. The *maxima* were for Perrins, 28·2°; for

Churruca, 28·7°; for Quevedo, 28·6°; for Rodman, 28·8°; for John Davy, 28·1°. The air that reposes on these equatorial waters, is 1° to 1½° colder than the Ocean. It results from these facts, that, on five-sixths of the circumference of the globe, the pelagic equatorial band, far from having a mean temperature of 29·2° (84·5° F.), has probably not even 28·5°. Mr. Atkinson himself admits (p. 171), that the mixture of oceanic and continental parts, tends to diminish the mean temperature of the equator. But in confining himself solely to the continental plains of South America, he adopts for the equatorial zone (from 1° N. to 1° S.), according to different theoretic suppositions, 29·2° or 31°. He founds this conclusion on the fact, that at 10° 27′ of latitude at Cumana, the mean temperature is 27·6°, and that, according to the law of the increase of heat from the pole to the equator (an increase which depends on the square of the cosine of latitude), the mean temperature of the equator must be at least above 29·2°. M. Atkinson finds the confirmation of this result, in reducing to the level of the equatorial sea, differences of temperature which I had observed on the declivity of the Cordilleras as far as 500 toises high. In employing the corrections which he thinks due to the latitude, and the progressive diminution of the heat in a vertical plan, he admits how much the position of places on vast table-lands or in narrow vallies, renders a part of those corrections uncertain. (*Mem. of the Astr. Soc.*, vol. ii, p. 149, 158, 171, 172, 182, 183.)

When the problem of the distribution of heat on the surface of the globe, is studied in all its generality, and disembarrassed of the accessory considerations of localities (for instance, of the effects of the configuration, colour, and geognostic nature of the soil, the predominance of certain winds, the proximity of the sea, the frequency of clouds and fogs, the nocturnal refraction towards a sky more or less serene, &c.), we find that the mean temperature of a station depends on the different manner in which the influence of the meridional height of the sun is manifested. That height at once determines the duration of the semi-diurnal arch; the length and diaphaneity of the portion of the atmosphere crossed by the rays before they attain the horizon; the quantity of rays absorbed or warming (a quantity which augments rapidly when the angle of incidence counted from the level of the surface increases); finally, the number of solar rays which a given horizon comprehends. The law of Mayer, with all the modifications which have been introduced within thirty years, is an empiric law that represents the generality of phenomena by approximation, and often in a satisfactory manner, but which cannot be employed to combat the testimony of direct observations. If the surface of the globe, from the equator to the parallel of Cumana, were a desert like Sahara, or a savannah uniformly covered with gramines like the Llanos of Calabozo and the Apure, there would be indubitably an increase of the mean temperature, from 10½° of latitude to the equator; but it is very probable that this increase would not attain ¼ of a degree of the centesimal thermometer. M. Arago, whose important and ingenious researches extend to every branch of Meteorology, has recognized, by direct experiments, that, from the perpendicular incidence to the 20° of zenital distance, the quantity of reflected light is nearly the same. He has also found that the photometric effect of the solar light varies very little at Paris, in the month of August, from noon till three in the afternoon, notwithstanding the change in the length of the way which the rays pass over in crossing the atmosphere.

If I fixed the mean equatorial temperature in round numbers, at 27½°, it was in order to attribute to the equatorial zone, properly so called (from 3° N. to 3° S.), the mean temperature of Cumana (27·7°). That town, surrounded with barren sands, placed beneath a sky always serene, and of which the light vapours never dissolve in rain, has a more ardent climate than all the places that surround it, and are equally placed at the level of the sea. In advancing in South America towards the equator, by the Oroonoko and the Rio Negro, the heat diminishes, not on account of the elevation of the soil, which from the fort San Carlos, is inconsiderable, but on account of the forests, the frequent rains, and the want of diaphaneity in the atmosphere. It is to be regretted, that even the most laborious travellers are so little enabled to advance the progress of Meteorology, by augmenting our knowledge of the mean temperature; they do not sojourn long in the countries of which we desire to know the climate; they can only collect for the annual mean, the observations of others, and often at hours, and with the aid of instruments, that are far from giving exact results. On account of the constancy of the atmospheric phenomena in the zone nearest the equator, a short space of time would suffice to give approximatively the mean temperature at different heights above the level of the ocean. I devoted myself every where to these kinds of researches; but the sole precise result I could obtain, is drawn from observations made twice a day, at Cumana. The real numeric numbers of Climatology can only be determined by well-informed persons, settled for a great number of years, in different parts of the world; and, in that point of view, the intellectual regeneration which is preparing in free equatorial America, from the shore to two thousand toises high, on the back and on the declivity of the Cordilleras, between the parallel of the isle of Chiloé and that of San Francisco of New California, will have the happiest influence on physical science.

In comparing what was known of the mean temperature of the equatorial region forty years ago with what we now know, we are astonished at the slow progress of positive Climatology. I have heard but of one mean temperature hitherto observed with some appearance of precision, between 3° N. and 3° S.; that of Saint Louis de Maranham (lat. 2° 29′ S.) at Brazil, which Colonel Antonio Pereira Lago finds, from observations made in 1821, three times a day (at 20^h, at 4^h, and at 11^h), to be 27·4° cent. (*Annaes das Sciencias, das Artes e das Letras*, 1822, vol. xvi, pl. 2, p. 55-80.) It is still 0·3° less than the mean temperature of Cumana. We know, below 10° of latitude, only the mean temperature of

Batavia (lat. 6° 12′ S.)	26·9° cent.
Cumana (lat. 10° 27′ N.)	27·7°

Between 10½° latitude, and the extremity of the torrid zone, follow:

Pondicherry (lat. 11° 55′ N.)	29·6°
Madras (lat. 13° 4′ N.)	26·9°
Manilla (lat. 14° 36′ N.)	25·6°
Senegal (lat. 15° 53′ N.)	26·5°
Bombay (lat. 18° 56′)	26·7°
Macao (lat. 22° 12′ N.)	23·3°
Rio Janeiro (lat. 22° 54′ S.)	23·5°
The Havannah (lat. 23° 9′ N.)	25·7°

To which may be added, from the observations of Colonel Pereira,

Maranham (lat. 2° 29′ S.)	27·4°

It appears to result from these statements, that the sole place in the equinoxial region, of which the temperature exceeds 27·7°, is situated in 12° of latitude. This is Pondicherry, of which the climate can no more serve to characterize the equatorial region, than the Oasis of Mourzouk, where the unfortunate Ritchie and Captain Lyon, assert that they saw, during whole months (perhaps on account of the sand spread in the air), the thermometer of Reaumur between 38° and 43°, characterizes the climate of the temperate zone in the north of Africa. The great mass of tropical lands are situated between 18° and 28° of north latitude; and it is of that zone that, from the establishment of so many rich and commercial towns, we possess most meteorological knowledge. The three or four degrees nearest the equator is *terra incognita* for Climatology. We are yet ignorant of the mean temperature of Grand Para, Guayaquil, and even Cayenne.

If we consider the heat of only certain parts of the year in the northern hemisphere, we there find climates even beyond the most ardent of the tropics. At Abusheer, for instance (lat. 28½°), the mean temperature of the month of July is 34°. In the Red Sea, the centesimal thermometer is, at noon, 44°; at night, 34½°. At Benares (lat. 25° 20′), the heat in summer attains 44°, while it lowers in winter to 7·2°. These observations on India were made with an excellent thermometer at the *maxima* of Six; the mean temperature of Benares is 25·2°.

The extreme heat observed in the southern portion of the temperate zone, between Egypt, Arabia, and the Gulf of Persia, is the simultaneous effect of the configuration of the surrounding lands, the state of their surface, the constant diaphaneity of the air destitute of aqueous vapors, and the length of the days, which increases with the latitude. Between the tropics great heats are rare, and generally do not exceed 32·8° at Cumana and Bombay; and 35·1° at Vera Cruz. It is almost useless to add, that the observations marked in this note were made in the shade, and far from the reverberation of the soil. At the equator, where the solsticial heights attain 66° 32′, the passages of the sun by the zenith are 186 days distant from each other; the solsticial height at Cumana, is in summer 76° 59′; in winter, 56° 5′, and the passages by the zenith (17th April and 26th August) at a distance of 131 days. Further north, at the Havannah, we find, solsticial height, summer, 89° 41′; winter, 43° 23′; distance of the passages (12th June and 1st July), 19 days. If these passages are not always recognized with equal evidence in the curve of the months, it is because in some places their influence is marked by the entrance of the rainy season, and other electrical phenomena. The sun, at Cumana, is during 109 days, or more precisely, during 1275 hours (from the 28th October to the 14th February following), lower than at the equator; but in that interval, its *maximum* of zenithal distance does not exceed 33° 55′. The slackened progress of the sun in approaching the tropics augments the heat of places situated further from the equator, above all, towards the confines of the torrid and temperate zones. Near the tropics, for instance, at the Havannah (lat. 23° 9′), the sun takes 24 days in passing over a degree on each side of the zenith; and at the equator, only five days. At Paris (lat. 48° 50′), where the sun lowers at the winter solstice to 17° 42′, the solsticial height in summer is 64° 38′. The sun is consequently, at Paris, from 1st May to 12th August, during the interval of 103 days, or 1422 hours, as high as at Cumana, at another period of the year. In comparing Paris and the Havannah, we find, at the former, from the 26th March to the 17th September, during 175 days, or 2407 hours, the sun as high as it is at another season within the tropic of Cancer. Now, in that interval of 175 days, the mean temperature of the hottest month (July), is 18·6°, according to the registers of the Royal Observatory of Paris, from 1806 to 1820; while at Cumana and the Havannah, when the sun lowers in the former place to 36·5°, and in the latter to 43·23°, the coldest month at Cumana, notwithstanding the long nights, is 26·2°; and at the Havannah, 21·2° of mean heat. In every zone, the temperature of one part of the year is modified by that of the preceding seasons. The lowering of the temperature within the tropics is inconsiderable, because in the anterior months the earth has received a mass of mean heat equivalent, at Cumana, to 27°, and at the Havannah, to 25·5° of the centigrade thermometer.

From the whole of the considerations which I have just stated, it appears to me by no means probable that the equatorial temperature can attain 29·2°, as the learned and respectable author of the memoir on *astronomical refractions* supposes. The ecclesiastic de Béze, the first traveller who gave the counsel to observe the coldest and hottest hours of the day, thought he had found, in the years 1686 and 1699, in comparing Siam, Malacca, and Batavia, "that the heat was not greater at the equator than at 14° of latitude." I believe that a difference exists, but it is very small, and marked by the effect of many causes which act simultaneously on the mean temperature of a place. The observations hitherto collected do not give as the measure of a progressive increase between the equator and the latitude of Cumana.

BOOK XI.

CHAPTER XXIX.

Passage from Trinidad of Cuba to Rio Sinu.—Carthagena.—Air Volcanoes of Turbaco.—Canal of Mahates.

On the morning of the 17th of March, we perceived the most eastern island of the groupe of the *Little Caymans.* In comparing the reckoning with the chronometric longitude, I ascertained that the currents had borne us in seventeen hours, twenty miles to the west. The island, which the English pilots call *Cayman-brack,* and the Spanish pilots *Cayman chico oriental,* forms a rocky wall, bare and steep towards the south and south-east. The north and north-west part, is low, sandy, and covered with little vegetation. The rock is divided into thin horizontal shelves. From its whiteness, and its proximity to the island of Cuba, I believed it to be of jurassic limestone. We approached the eastern extremity of *Caymanbrack* within the distance of 400 toises. The neighbouring coast is not entirely free from danger and from breakers; yet the temperature of the sea had not sensibly diminished at its surface. It was 25·5°; while at 20° 25′ of latitude, in the open sea, fifteen leagues distance from *Caymanbrack* and the *Cayos de los doce leguas*, I found 25·3° of the centigrade thermometer. I mentioned in another place, the doubts in which the astronomical positions of the Great and the two Little Caymans[*] have so long been enveloped. These doubts will then only be entirely removed when some observer, furnished with several chronometers, shall have successively examined the three islands, and determined their length and respective distances, connected with the meridian of cape Saint Antonio[†]. The timekeeper of Louis Berthoud, gave me 82° 7′ 37″, for the longitude of the eastern cape of *Caymanbrack*, supposing the port of Batabano 84° 45′ 56″, and the town of Trinidad of Cuba, 82° 21′ 7″. The latitude reduced by the reckoning on the rhumbs of wind at the meridian observation, appeared to me to be 19° 40′ 50″. Don Ciriaco Cavallos, who visited this coast a year after my voyage, has marked it 19° 42′; but the longitude on which he has fixed by the transport of time from Aguadilla de Portorico, is 8′ more easterly than mine *. It is the general opinion of the pilots, that the dip of the loaded needle differs greatly around the Caymans, from that which is observed at the western extremity of Jamaica and near the isle of Pinos. The calcareous nature of the rock, and the magnetic experiments made in those latitudes †, little favor this supposition. In

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[*] *See* above, vol. vi, p. 815, and the Analysis of the Map of the island of Cuba, p. 23. The longitude (83° 46′) assigned by Admiral Roussin at the Cape N. W. of the Great Cayman agrees with the longitude of the Cape S. E. (83° 25′) found by Captain Wallace Monteath, in 1820. See *Chart of the Mexican Sea by Purdy and Mackellar* (December 1823). The fine Map of the West Indies, by Captain De Mayne (London, 1824), also places the Cape N. W. of the Great Cayman 83° 50′.

[†] The Chart of the *Oceano Atlantico*, published by the hydrographic depôt of Madrid, in 1804, reduces the Channel

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between the Great Cayman and the Little Western Cayman to thirty miles. This Channel is, according to De Mayne, 56′; and according to Livingston and Purdy, 1° 2′. Captain Mackellar and De Mayne differ also five miles in the length of the Great Cayman.

* The recent maps of De Mayne, Livingston, and Mackellar, place the eastern cape of Caymanbrack at 82° 15′, whence results a difference of 7′ towards the west.

† The detailed plan of the Great Cayman, by Purdy and Mackellar, indicates the magnetic dip at Boddentown, 8° east; in the Channel of Yucatan, it is 8½°, but, at the Havannah and Kingston, 6° 0′ to 6° 45′; and at cape Beata, as at

navigating on a sea where the currents vary with the winds and seasons, when the relative place of the point of departure is very imperfectly known, and the islands to be avoided, it is natural that those islands should appear often to the navigator, where they were least expected to be found; and the compass is accused, when we ought to complain of the uncertainty of the reckoning and the imperfection of astronomical geography.

As long as we were in sight of the rock of *Caymanbrack*, sea-turtles of an extraordinary dimension swam around our vessel. The abundance of these animals led Columbus to give the whole groupe of the *Caymans*, the name of *Peñascales de las Tortugas*, rock of the turtles. The sailors would have thrown themselves into the water in order to take some of those animals; but the great number of sharks that accompany them, rendered the attempt too perilous. The sharks nailed their jaws to

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Cumana, 4° 0′ to 4° 15′. In those latitudes the *curve* of the *magnetic variation* runs from S. E. to N. W. According to the very precise observations of Captain Sabine, the magnetic dip at Jamaica (Port Henderson), was 46° 58′; at Great Cayman, 48° 48′; at the Havannah, 51° 55′; while the magnetic intensity was represented, in those three places, by the numbers 1·62, 1·63, and 1·72. *Exper. Pendulum* (1825), p. 474 and 490. This progress of the phenomena is very regular.

great hooks of iron which were flung to them; these hooks were very sharp and (for want of *anzuelos encadenados*) tied to cords; the sharks were in this manner heaved up half their body, and we were surprised to see that those which had already their mouths bloody, again seized this sort of bait during whole hours *. At the sight of sharks, the sailors in a Spanish vessel always recollect the local fable of the coast of Venezuela, where the benediction of a holy bishop † softened the habits of the Squals, which are every where else the dread of mariners. Are these wild sharks of the port of La Guayra specifically different from those which cause such terrible accidents in the port of the Havannah? Do the former belong to the small groupe of *Emissoles* with small sharp teeth, which M. Cuvier* has separated from the *Melandres*, by the name of *Musteli?*

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* *Vidimus quoque squales, quotiescunque hamo icti dimidia parte corporis e fluctibus extrahebantur, cita alvo stercus emittere haud absimile excrementis caninis. Commovebat intestina (ut arbitramur) subitus pavor.* Although the form and number of teeth change with age, and the teeth appear successively in the squals, I doubt if it can be admitted, with Don Antonio Ulloa (*Memorias secretas de America dirigidas al Marquès de la Ensenada*, vol. i, p. 5), "that the young sharks have two, and the old four rows (*andanas*) of grinders." These, like many other sea-fish, are easily accustomed to live in fresh water, or water a little briny. It is observed that sharks (*tiburones*) abound of late in the *Laguna* of Maracaybo, where they have been attracted by the carcasses thrown into the water after the frequent combats between the Spanish royalists and the Columbian republicans. (*Manuscripts of M. Plèe*, travelling naturalist of the Museum of Natural History of Paris, part vi, fol. 88.)

† *See* above, vol. iii, p. 383.

The wind freshened more and more from the south-east, as we advanced towards cape Negril and the western extremity of the great bank of la Vibora. We were often forced to drive from our course; and, on account of the extreme smallness of our vessel, we were almost constantly under water. The 18th March, at noon, we found we were in latitude 18° 17′ 40″, and in 81° 50′ of longitude. The horizon, to the height of 15°, was covered with those reddish vapours so common within the tropics, and which never seem to affect the hygrometer at the surface of the globe. We passed fifty miles west of cape Negril on the south, nearly at the point where several charts indicate an insulated flat, of which the position is similar to that of *Sancho Pardo*, opposite cape Saint Antonio of Cuba. We saw no change in the bottom. It appears that the *Rocky Shoal*, at four fathoms, near cape Negril, no more exists than the rock (*Cascabel*) itself, long believed to mark the western extremity of la Vibora (*Pedro*

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* *Animal Kingdom*, vol. ii, p. 128.

Bank), as *Portland Rock* or *la Sola* designates the eastern extremity. The 19th of March, at four in the afternoon, the muddy colour of the sea announced that we had reached that part of the bank of la Vibora, where we no longer find fifteen, and scarcely nine to ten fathoms of water. Our chronometric longitude was 81° 3′; and our latitude probably below 17°. I was surprised that, at the noon observation, at 17° 7′ of latitude, we yet perceived no change in the colour of the water. Having twice crossed this bank, in its length and breadth, and having tried to determine the position of its principal *dangers*, I may here be permitted to add, that the map of Captain Mayne only, appeared to me conformable to what I had observed of the real form, and southern and eastern limits of la Vibora. That map indicates with great precision the sudden diminution of the depth at 16° 54′ and 17° 5′ of latitude, and 81° 2′ of longitude, which I have just mentioned, as well as the breakers twenty-four miles south-east of *Pedro Kays* (*Nordest Kays*) on which we had nearly perished in the night of the 6th of December*, in going from Nueva Barcelona to the Havannah. Spanish vessels going from Batabano or Trinidad de Cuba to Carthagena,

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* Vol. iii, p. 813. The *General Chart of the West Indies*, published in 1824, by order of the English Admiralty, places "a rock five feet above the water," lat. 16° 49′, and long. 80° 32′. From this rock a chain of breakers extends at twenty-two miles distance, in the direction S. E. and

N. W., towards the isle of *Savannah,* or *South West Kay,* and further, towards the isles of *Pedro Kays.* The rock which put us in danger, in the night of the 6th of December, and on which we should indubitably have struck, but for the vigilance of a passenger, M. Fernandez, is, according to my observations, in latitude 16° 50′, and longitude 80° 44′. This longitude has been deduced by M. Oltmanns, from horary angles which I had taken the evening before, a little before sun-set, and in the morning of the 7th of December. Other combinations on the errors of the reckoning, had given me on the very spot, a more eastern longitude. When from *South Kay,* or the most southern of the *Pedro Kays,* we direct our course S. W. at eighteen miles distance, we enter among the breakers which succeed each other from N. W. E. to S. S. W., but of which the southern extremity turns towards the S. E., as in a sack. I have also some reasons for believing that the bank of la Vibora, indicated by the muddy colour of the water, extends on the south of the *Pedro Kays,* a little more towards the south than the charts indicate, even that of M. De Mayne. With respect to the *Piedra del Monarca* of the Spanish maps (the rock on which the ship *el Monarca* was nearly lost in 1798), it cannot be placed as M. Espinosa indicates (*Memorias del Depósito hydrografico of Madrid,* vol. ii, p. 68), in latitude 16° 44′ 26″, and longitude 80° 23′ 23″. That position, according to the limits assigned to the bank of the Vibora in M. De Mayne's chart, would fall beyond the bank, ten miles distant on the south. It must, however, be recollected in this discussion, that M. De Mayne differs from the charts of the *Deposito,* and those of Purdy and Livingston, both in the absolute and relative longitudes of Jamaica. It places cape Negril at the western extremity of the Vibora, 13′ and usually pass over the bank of la Vibora, on its western side, at fifteen to sixteen fathoms of water. The dangers of the breakers begin only beyond the meridian 80° 45′ of west longitude. In passing along the bank on its southern limit, as the pilots often do in the passage from Cumana or other parts of the main land to the Great Cayman or cape Saint Antonio, they need not ascend, along the rocks, above 16° 47′ of latitude. Fortunately the currents run on the whole bank to the S. W.

In considering la Vibora not as submerged land, but as a heaved-up part of the surface of the globe which could not reach the level of the sea, we are struck to see this great submarine island display, like the neighbouring land of Jamaica and Cuba, the loftiest heights

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10′ more eastward, and *Port Royal* with Captain Sabine (*Pendul. Exper.*, p. 401), 79° 13′, which, according to the observations of Macfarlane and Candler, had hitherto been believed to be 79° 5′ 30″. The following is the comparison of some points which I could only survey at great distances. I found (in 1801): *Cape Beata*, 73° 50′ (De Mayne, 73° 53′); cape *Abacou*, long. 76° 7′ 50″ (De Mayne, 76° 8′); *Ranas*, or Morant Kays, center 78° 23′ 35″ (De Mayne, 78° 20′); *cape Portland*, long. 79° 19′, but seen at 50′ of distance (De Mayne, 79° 32′); *Pedro Kays*, employing the horary angles which I had taken three hours before, according to M. Oltmanns, long. 80° 3′; according to my calculations made on board, and the combinations of the reckoning (*Obs. astr.*, *Introduction*, p. xliii), long. 8° 13′ 45″ (De Mayne, 80° 14′).

towards its eastern boundary. There are placed *Portland Rock*, *Pedro Kays*, and *South Kay*, surrounded with dangerous breakers. The depth is six or eight fathoms; but, in advancing to the middle of the bank, along the line of the summit, first towards the west, and then towards the north-west, the depth becomes successively ten, twelve, sixteen, and nineteen fathoms. When we consider on a map the proximity of the high lands of Saint Domingo, Cuba, and Jamaica, in the neighbourhood of the *Windward Channel*, the position of the island of Navaza and the bank of Hormigas, between the capes Tiburon and Morant; finally that chain of successive breakers from the Vibora, by *Baxo Nuevo*, Serranilla and Quita-Sueño as far as the Sound of the Mosquitos, we cannot but recognize in this system of islands and flats, the almost continued trace of a *heaved up ridge*, running from N. E. to S. W. This ridge and the ancient dyke, which links by the rock of Sancho Pardo, cape Saint Antonio to the peninsula of Yucatan, divides the great sea of the West Indies into three partial basins, similar to those we observe in the Mediterranean *. I examined in this passage, as I had done in going † in an American vessel, with

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* *See* above, vol. vi, p. 552.

† Vol..vi, p. 814.

Captain Newton, from Nueva Barcelona to the Havannah, the influence of the depth of the sea on the temperature of the surface; but these reiterated attempts were not successful. I found, between Caymanbrack and the parallel of cape Negril, consequently on the north of the bank of la Vibora, in the deepest waters, 25·5° to 25·8°. On the bank itself, at nine or ten fathoms deep, the most troubled waters indicated 25·6°. Is it the rapidity of the currents which prevents the bank from exercising its action on the temperature? Further north, between the *Jardines y Jardinillos*, and especially among the breakers of Diego Perez, I found, according to the changes of depth, a difference as great as 4·2°. In the Sound of Campeachy *, at fifteen fathoms, the temperature lowers at the surface, 2·5°: I saw on the Great Bank of Newfoundland (in July 1804), the thermometer[*] between 8·3° and 12·2°, while far from the bank, and beyond the *Gulf-stream,* it kept up at 19·4°; and in the *Gulf-stream,* at 21·1°. Mr. Sabine, in a work filled with important observations on the distribution of heat on the globe, regards also the rapidity of the currents as the real cause that some shoals[†] have an influence on the temperature of the Ocean. This circumstance is very important for the safety of navigation. A sudden change in the heat of the waters should always fix the attention of pilots; it indicates either a change in the currents, or the proximity of a bank; but as there are some banks which are not manifested by the colour of the waters, so there are some also which do not sensibly affect the temperature of the Ocean. In general (and I made the observation during the four days which I passed on the Great Bank of Newfoundland), it appeared to me that the lowering of the temperature is greatest on the edge *(accores)* of the banks, and augments but little towards the middle. Does not this phenomenon seem to prove that the cold of the flats is less produced by the molecules of water that cool by reflection, at the surface of the Ocean, during winter, or at night, and in summer in falling towards the bottom, than by the heaving up of the lower layers of the Ocean, and their mixture with the upper layers near the edge of the banks?

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* *Manuscript Observations of Don Lucas Alaman.* The 20th February, 1820, lat. 22° 14′, long. 89° 4′; sea, 25° (air, 27·5°): February 21st, lat. 21° 53′; long. 90° 15′; sea, 22·5° (air, 24·3°). *See* also above, *Per. Nar.*, vol. i, p. 29,; vol. ii, p. 142; vol. iii, p. 367. The diminution of the temperature observed on the north of Tobago, was probably produced by some accidental cause. The shoal indicated in the chart of Borda as joining Tabago and Grenada, is suppressed in the most recent marine charts. Those charts however, mark, at twelve miles distance from the South Cape of Grenada, soundings of eighteen and nineteen fathoms deep. Would that land sustain the soundings further in the open sea?

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[*] During this time, the air at noon, on the bank, was between 14·3° and 15 5°. (Observations on the centigrade thermometer, which is always meant in this work, when the contrary is not expressly indicated.)

[†] For instance, on the coast of Maranham. (*Sabine, Pendulum Exper.*, p. 445.)

The colour of the troubled waters on the shoal of the Vibora, is not, properly speaking, milky, like the colour of the waters in the *Jardinillos* and on the bank of Bahama; it is of a dirty grey. These striking differences of tint on the bank of Newfoundland, in the archipelago of the Bahama islands, and on the Vibora, these variable quantities of earthy matter, suspended in the more or less troubled waters of the soundings, may be alike the effect of the variable absorption of the rays of light, contributing to modify to a certain point the temperature of the sea. Where the shoals are 8° to 10° colder at their surface than the surrounding sea, we cannot be surprised that they produce a local change of climate. A great mass of very cold water, as on the bank of Newfoundland, in the current of the Peruvian shore (between the port of Callao and Punta Pariña*), or in the African current near cape Vert *, have necessarily an influence on the atmosphere that covers the

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* I found the surface of the Pacific Ocean, in the month of October 1802, on the coast of Truxillo, at 15·8° cent.; in the port of Callao, in November, at 15·5°; between the

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parallel of Callao and Punta Pariña, in December, 19° and progressively, when the current advanced towards the equator, and receded towards the W. N. W., 20·5° and 22·3°. The temperature of the sea in the same latitudes, beyond the current, was at the same epoch, 27·2°. This phenomenon, of the greatest importance for the climate of Peru along the shore, struck me the more forcibly, as till then no traveller had seen the temperature of the sea decrease between the tropics, far from the coasts, to 15·5° (60° Fahr.). The great number of observations made by different navigators, between 14° north and 14° south, fixed, for the tropical region, the *extreme limits* of the temperature of the Ocean at its surface, at 22·4° and 30·6°. The former temperature prevails in the month of July, in the channel between the African island of Saint Thomas and the Ascension; the latter observation was made opposite the Punta Guascama, on the coast of Peru, at 2° 5′ of north latitude. The *mean limit* of the tropical region is but from 25° to 28°. A distinguished officer of the royal Danish marine, the Baron Dirckinck de Holmfeldt, has recently confirmed (in 1825) my observations on the current of cold waters of Peru; he found the waters of Callao, in August, 15·7°; in June, 18·1°; in March, 19·5°; in January and February, from 22° to 24·6°. The waters, in March and April, were beyond the current, and on the north 2½° of lat.; on the south, 26·4° to 29·7°. I shall discuss, in another place, the influence which the *garua* and the *mollizna*, that is, the vapors which, on the shore of Lower Peru, veil the sun from the month of April and May till November, exert on the temperature of a portion of the Ocean, in weakening the action of the rays absorbed by the surface of the water.

* Between cape Manoel and the isle of Gorée, where

sea, and on the climate of the neighbouring land; but it is less easy to conceive that those slight changes of temperature (for instance, a centesimal degree on the bank of la Vibora), can give a peculiar character to the atmosphere of the shoals. Do these *submarine islands* act upon the formation and accumulation of the vesiculary vapours in another manner than by cooling the waters of the surface?

In quitting the bank of la Vibora, we passed between the *Baxo Nuevo* and the light-house of *Comboy*. The former was then believed to be in the meridian of the western extremity of la Vibora, in 81° 28′ of longitude, and 15° 57′ of latitude. Some years later, in 1804, the colleague of Fidalgo Don Manuel del Castillo, captain of a frigate, was sent to fix the positions of the rocks of *Roncador*, *Serrana*, *Serranilla*, and the neighbouring *dangers;* he placed the *Baxo Nuevo* at 15° 49′ of latitude, and 80° 56′ of longitude *. If such be in fact the position, and I am led to think so, we must have almost touched the shoal in the day time on

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Captain Sabine found the surface of the Ocean, in May 1822, 17·7° to 20·5°; while, beyond the current, which bears S. S. E., the temperature was 22° to 23°. (*Pendul. Exper.*, p. 434.)

* Compare the two editions of the *Carta del Mar de los Antillas*, published by the hydrographic Depôt of Madrid, in 1805 and 1809.

the 20th of March, when we found ourselves, at noon, in 16° 5′ of latitude. On the 19th, my chronometric longitude was 81° 6′ on the bank of la Vibora; and, the 22d of March, on the parallel 13° 41′, 80° 49′. It results * from these precise statements, that, without reckoning the partial variations caused by the currents, we must have crossed the parallel of *Baxo Nuevo*, at the meridian of 80° 55′. M. De Mayne appears to doubt altogether the existence of this shoal. That able navigator marks *Comboy* only on his chart (lat. 15° 40′, long. 80° 12′), which M. Castillo had sought for vainly between 15° 45′ and 15° 54′ of latitude. It is to be hoped that new observations will fix the longitude of *Baxo Nuevo*, which may become so dangerous to vessels going from the Havannah to Portobello and Carthagena. I thought it my duty not to pass silently over the doubts which have arisen in my mind from my own experience. The temperature of the sea was, at 16° 5′ and 13° 36′ of latitude, constantly 26·6°; 26·8°; 26·5°.

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* I regret that I do not find on my journal the chronometric longitude of the 20th and 21st March. The journal merely indicates that, during two days, I had taken the lunar distances to compare the method of calculation of Borda with that of Bodtwitsch, which we find explained in the *Almanaque nautico de Cadiz*, 1801; but the results of the distances are not marked upon the registers.

22d *March.*—We passed more than thirty leagues to the westward of *Roncador.* This shoal bears the name of *Snorer,* because the pilots assert, from ancient traditions, that a sound like snoring *(roncar)* is heard from afar. If this noise actually occurs, it arises, no doubt, from a periodical issuing of the air compressed by waters in a rocky cavern. I have observed the same phenomenon on several coasts, for instance, in the promontories of Teneriffe, in the limestones of the Havannah *, and in the granite of Lower Peru, between Truxillo and Lima. A project was formed at the Canary islands, of placing a machine at the issue of the compressed air, and employing the sea as an impelling force. While the autumnal equinox (*el Cordonazo de San Francisco*) is every where dreaded in the sea of the West Indies, with the exception of the coast of Cumana and Carracas, the spring equinox produces no effect on the tranquillity of those tropical regions: a phenomenon, almost the inverse of what is observed in the high latitudes. Since we had quitted la Vibora, the weather was remarkably fine; the surface of the sea, of a blue indigo, sometimes violet, on account of the innumerable quantity of meduses and eggs of fish (*purga de mar*) which covered it, was gently agitated. The thermometer kept up, in the shade, at 26° to 27°; not a cloud arose on the horizon, although the wind was constantly north, or N. N. W. Can we attribute to this wind, which cools the higher layers of the atmosphere, and there produces icy crystals, the *haloes* which were formed round the moon two nights successively? The *haloes* were of small dimension, the diameter 45°. I never had occasion to see and measure those[*] of which the diameter had attained 90°. The disappearance of one of those lunar *haloes* was followed by the formation of a great black cloud, which let fall some drops of rain; but the sky soon resumed its fixed serenity, and we saw a long series of falling stars and *bolides,* which moved in the same direction, and contrary to that of the wind of the low regions.

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* *See* above, p. 52, note 2.

23*d March.*—The comparison of the reckoning with the chronometric longitude, manifested the force of a current which bears towards the W. S. W. Its swiftness in the parallel of 17°, was twenty to twenty-two miles in twenty-four hours. I found the temperature of the sea a little diminished; in lat. 12° 35′, it was only 25·9° (air 27·0°). During the whole day, the heavenly vault displayed a spectacle which struck even the most indolent sailors, and which I had already remarked June 13th, 1799. There was a total absence of clouds, even of those light vapours called *dry;* yet the sun coloured with a fine tint of rose, the air, and the horizon of the sea. Towards night, the sky was covered with great bluish clouds; and when they disappeared, we saw, at an immense height, fleeces of clouds in regular spaces, and ranged in convergent bands. Their direction was from N. N. W. to S. S. E., or more exactly, N. 20° W., consequently contrary to the direction of the magnetic meridian. Can the uniform spaces which this small groupe of vapours displayed, be considered as the effect of an electric repulsion, such as is seen in the figures of Lichtenberg on the electrophore, in the congelation of the vapours on our windows, and in the dendrites of manganese that cover the rents of jura limestone? I beheld with surprise, that the points of convergence, and the poles of these bands of clouds, did not remain motionless, but approached by degrees the *poles of the world,* without however attaining them. The vapours became invisible towards two in the morning. I have since frequently observed this phenomenon, which recalls some appearances of the aurora borealis and australis, and which is certainly not the simple effect of an optical illusion (parallel streaks of clouds placed in the direction of the winds). It is displayed at all seasons, especially in very calm nights, at Quito, Mexico, and in Italy and France; I have marked it in my journals by the name of *polar bands*, moveable, or immoveable; the latter are often placed in the magnetic meridian of the spot. Many philosophers in Europe have fixed their attention on these bands. It were to be wished that the azimuth of their poles, the direction and swiftness of their movement, their relations to the horary declination, and the intensity of their magnetic force, were measured with precision.

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[*] In Captain Parry's first voyage, *haloes* were measured round the sun and moon, of which the rays were 22½°; 22° 52′; 38°; 46°. (*Northwest Passage,* 1821, p. 119, 131, 155, 172.) Can one be deceived with an instrument of reflection, on account of the paleness of the milky way, more than twenty minutes, when we are not guided by the position of some star situated at the limit of the crown? (*Scoresby's Greenland,* p. 277-283.)

24th March.—We entered that kind of gulf which is bounded on the east by the coast of Saint Martha, and on the west by Costa Rica; for the mouth of the Magdalena and that of the Rio San Juan de Nicaragua, are on the same parallel, nearly at 11° of latitude. The proximity of the Pacific Ocean, the configuration of the neighbouring lands, the smallness of the isthmus of Panama, the lowering of the soil between the gulf of Papagayo and the port of San Juan de Nicaragua, the vicinity of the snowy mountains of Saint Martha, and many other circumstances, too numerous to mention, give a peculiar climate to this gulf. The atmosphere is agitated by violent gales, known in winter by the name of the *brizotes de Santa Marta*. When the wind abates, the currents bear to the N. E., and the conflict between the slight breezes (from the E. and N. E.) and the current, renders the sea rough and agitated. When it is calm, the vessels going from Carthagena to Rio Sinu, at the mouth of the Atrato and at Portobello, are impeded in their course by the *currents of the coast*. The *heavy* or *brizote* winds, on the contrary, govern the movement of the waters, and change it in an opposite direction, towards W. S. W. It is the latter movement which Major Rennell, in his great and ingenious hydrographic work, calls *drift*, and which he distinguishes from real *currents*, which are not owing to the local action of the wind, but to differences of level in the surface of the Ocean, to the rising and accumulation of waters in very distant latitudes. The observations which I have collected on the force and direction of the winds, on the temperature and rapidity of the currents, on the influence of the seasons, or the variable declination of the sun, have sufficed to throw some light on the complicated system of those pelagic floods that furrow the surface of the Ocean: but it is less easy to conceive the causes of the change which the movement of the waters undergoes, at the same season and with the same wind. Why is the *Gulf-stream* sometimes borne on the coast of Florida, sometimes on the border of the shoal of Bahama? Why do the waters flow during whole weeks from the Havannah to Matanzas, and (to cite an example of the *corriente por arriba,* which is sometimes observed* in the most eastern part of the main land, by winds alike gentle) from la Guayra to cape Codera and Cumana?

25th March.—As we advanced towards the coast of Darien, the north-east wind increased with violence. We might have thought ourselves transported to another climate. The sea became very rough during the night, yet the temperature of the water kept up (from lat. 10° 30′, to 9° 47′) at 25·8°. We perceived, at sunrise, a part of the archipelago † of Saint Bernard, which closes the gulf of Morrosquillo, on the north. A clear spot between the clouds enabled me to take the horary angles. The chronometer, at the small isle of Mucara, gave 78° 13′ 54″ of longitude*. We passed on the southern extremity of the *Placer de San Bernardo.* The waters were milky, although a sounding of twenty-five fathoms did not indicate the bottom; the cooling of the water was not felt, no doubt on account of the rapidity of the current. Above the archipelago of Saint Bernard and cape Boqueron, we saw in the distance the mountains of Tigua. The stormy weather, and the difficulty of going up against the wind, induced the captain of our frail vessel to seek shelter in the Rio Sinu, or rather, near the *Punta del Zapote,* situated on the eastern bank of the *Ensenada de Cispata,* into which the river Sinu or Zenu of the first *Conquistadores* throws itself. It rained with violence, and I availed myself of that occasion to measure the temperature of the rain water; it was 26·3°, while the thermometer in the air kept up in a place where the ball was not humected, at 24·8°. This result differed much from that we had obtained at Cumana, where the rain water was often a degree colder than the air †.

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* Compare above, vol. iii, p. 377; vol. iv, p. 207.

† It is composed of the isles Mucara, Ceycen, Maravilla, Tintipan, Panda, Palma, Mangles, and Salamanquilla, which rise little above the sea, but some of which have the form of a bastion. There are two passages in the middle of this archipelago, from seventeen to twenty fathoms. Large vessels can navigate between the Isla Panda and Tintipan, and between the Isla of Mangles and Palma.

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* *Obs. astr.*, tom. ii, p. 142.

† As within the tropics. It takes but little time to collect some inches of water in a vase with a wide opening, and narrow towards the bottom; and I do not think there

Having again reached the continent of South America, I shall take a last survey of the whole basin of the West Indian sea. I have collected

can be an error in the observation, when the heat of the rain water differs from that of the air. If the former is less, it is, however, to be feared that only a part of the total effect is observed. I often found, at Mexico, at the end of June, the rain at 19·2° or 19·4°, when the air was at 17·8° and 18°. In general, it appeared to me, that within the torrid zone, either at the level of the Ocean, or on table-lands from 1200 to 1500 toises high, there is no rain but that of storms, which falls in large drops, very distant from each other, and sensibly colder than the air. (*See* vol. vi, p. 789.) These drops bring with them no doubt the low temperature of the high regions. In the rains which I found hotter than the air, two causes may act simultaneously. Great clouds heat by the absorption of the rays of the sun which strike their surface (*Lignes, isoth.*, p. 13; *Fresnel in Bull. de la Soc. Philom.*, 1822, p. 200), the drops of water in falling cause an evaporation, and produce cold in the air. The temperature of rain water, which occupied me during my voyage, is become a more important problem since M. Boisgiraud, professor of experimental philosophy at Poitiers, has proved, that in Europe rain is generally sufficiently cold, relatively to the air, to cause precipitation of vapour at the surface of every drop; and since, that philosopher has sought in this effect, the cause of the unequal quantity of rain collected at different heights. (*Arago, Ann. de Chimie, Dec.* 1826, p. 417.) When we recollect that one degree only of cooling precipitates more water in the hot climate of the tropics, than by a temperature of 10° to 13°, we must not be surprised at the enormous size of the drops of rain that fall at Cumana, Carthagena, and Guayaquil. (*See* above, vol. v, p. 348.)

in one table the indications of temperature contained in my journals, and have added what I could collect from the manuscript notes of several travellers, who, at my request, devoted themselves to this kind of researches, with thermometers carefully rectified.

TEMPERATURE OF THE CARIBBEAN SEA AT ITS SURFACE, ON THE SOUTH OF THE CHANNEL OF YUCATAN.

Latitude.	Western longitude from the meridian of Paris.	Temperature of the sea. *(cent. Th.)*	Temperature of the air. *(cent. Th.)*	REMARKS.
22° 15′	84° 37′	(23·5°)	28·7°	Humboldt, March 1801, south of Cuba, in the *Jardines*, depth, 7 feet.
21 59	84 3	(24·5)	27·7	*Id.*, near Cayo Flamenco ; depth, 10 feet.
21 56	83 35	(22·7)	30·4	*Id.*, a little east of Cayo de Piedras ; depth, 10 feet.
21 58	84 5	(22·6)	29·2	*Id.*, near Cayo de Diego Perez ; depth, 8 feet.
21 45	82 41	26·8	30·7	*Id.*, deep sea, opposite the mouth of Rio San Juan.
21 44	87 18	26.7	27·2	Humb., Dec. 1800, near Cape Saint Antonio.
20 43	86 45	(24·6)	19·8	*Id.*, Dec. near Cape Corientes, violent wind, N.N.E., current bearing E.S.E. ; deep sea.
20 42	86 25	25·0	26·8	Alaman, February 1820.
20 13	85 11	25·0	28·1	*Id.*, between the Isle of Pinos and the Great Cayman.
19 45	82 9	25·5	27·0	Humb., March 1801, near Caymanbrack.
19 36	83 40	25·0	20·3	*Id.*, Dec. 1800, near the Great Cayman.
18 45	82 20	28·3	27·5	Sabine, Nov. 1822, between Jamaica and the Great Cayman.
18 37	82 30	25·6	27·0	Alaman, Feb. 1820, between Jamaica and Cuba, S.E. of Cape Cruz.
17 51	79 13	28·3	28·6	Sabine, Nov. 1822, between Jamaica and Saint Domingo.
17 50	78 18	28·3	28·5	*Id.*, Nov.

TEMPERATURE OF THE CARIBBEAN SEA AT ITS SURFACE, ON THE SOUTH OF THE CHANNEL OF YUCATAN (*continued*).

Latitude.	Western longitude from the meridian of Paris.	Temperature of the sea. *(cent. Th.)*	Temperature of the air. *(cent. Th.)*	REMARKS.
17° 47′	79° 9′	25·0°	28·1°	Alaman, Feb. 1820, S.S.W. of Cape Tiburon.
17 22	70 42	25·0	26·2	*Id.*, Feb. 1820, S.S.W. of Cape Engaño.
17 22	81 8	25·8	26·0	Humb., March 1801, west of Cape Negril (long. a little doubtful).
17 18	78 23	26·8	23·5	*Id.*, December 1800, wind N.N.W., south of Morant Kays.
17 18	73 7	25·0	26·2	Alaman, Feb. 1820, south of Cape Beata.
17 15	81 5	(26·0)	25·4	Humb., Dec. 1800, on La Vibora; depth, 18 fathoms; wind, N.N.E
17 12	68 13	25·0	26·2	Alaman, Feb. 1822, south of Portorico.
17 1	80 3	(26·4)	23·2	Humb., December, on the bank o La Vibora, near Piedro Kays.
17 0	76 7	26·6	23·0	*Id.*, Dec. 1800, wind N.N.W., in the meridian of Cape Abacou.
16 58	81 0	(25·6)	25·8	*Id.*, March 1801, on the bank of La Vibora; depth, 10 fathom; current S.W. (long. a little doubtful).
16 52	80 10	(25·7)	20·2	*Id.*, December 1800, on the eastern rocks of La Vibora; wind, N.W.; waters troubled (long. a little doubtful).
16 36	65 43	24·5	26·8	Alaman, February 1822, S.S.W. of Saint Eustacius.
16 26	73 13	27·0	23·2	Humb., December 1800, south of St Domingo.
15 2	71 42	27·3	24·2	*Id.*, December, current W.N.W., i the middle of the basin, between Curaçoa and Cape Saona.
15 2	73 5	28·2	27·7	Sabine, October 1822, in the middl of the basin, between the Cape Saint Roman and Beata.
14 30	61 55	26·0	25·7	MM. Martin and Dupont, Januar 1826, east of Martinique.

TEMPERATURE OF THE CARIBBEAN SEA AT ITS SURFACE, ON THE SOUTH OF THE CHANNEL OF YUCATAN (*continued*).

Latitude.	Western longitude from the meridian of Paris.	Temperature of the sea. (*cent. Th.*)	Temperature of the air. (*cent. Th.*)	REMARKS.
13° 38′	80° 49′	26·8°	26·4°	Humb., March 1801, middle of the basin, between Jamaica and Darien, nearly in the parallel of Roncador.
13 18	68 16	28·3	27·7	Sabine, October 1822, middle of the basin, nearly in the meridian of Cape Codera, and in the parallel of the island of Saint Vincent.
12 41	69 10	25·6	22·8	Humb., November, wind E.N.E. 40 miles north of Los Roques.
12 36	81 12	25·9	27·0	*Id.*, March 1801, middle of the basin, between Vibora and the isthmus of Panama, in the parallel of the island of Saint Andrews.
12 24	66 3	28·3	28·4	Sabine, October 1822, between isla Blanca and the Grenadines.
11 20	64 10	25·4	26·2	Humb., north of the Boca de Dragos (lat. doubtful).
11 15	66 30	27·7	27·2	Boussingault, November 1822, north of the island of la Marguerita.
11 15	62 45	25·8	25·1	Humb., July 1799, east of Tobago.
10 50	65 0	(23·0)	25·4	*Id.*, July. opposite Cabo de tres Puntas; depth, 32 fathoms.
10 45	68 35	26·9	27·4	Boussingault, November 1822, near the coast of Venezuela.
10 40	66 32	(23·1)	27·2	Humb., August 1799, at Punta Araya, on the northern coast, surrounded by shoals.
10 36	69 27	26·8	27·7	Boussingault, November 1822, in the port of La Guayra.
10 30	80 10	25·9	24·7	Humb., March 1802, west of Carthagena, nearly in the meridian of the Gulf of Darien.
10 27	66 30	26·1	28·0	*Id.*, October 1800.
10 10	64 25	(29·1)	27·0	Sabine, October, in the Gulf of Paria.

The preceding table* relates only to the *West Indian Sea,* properly so called, which terminates towards the north of the strait of Yucatan, and is divided, according to geological surveys†, in two partial basins, that of *Honduras,* and of the *Caribbean Sea.* This Mediterranean of America presents a surface of more than 60,000 square marine leagues, quadruple the surface of France; and is consequently two-thirds of the surface of the Mediterranean of Europe; but, as the temperature varies less in the different seasons from that of the atmosphere, it has also a less powerful influence on the climate of the neighbouring countries. It extends, taking for the extreme limit the bottom of some inlets*, from 7° 55′ to 22° 40′ of latitude; but if we confine ourselves to considering the geographical position of the greater part of its surface, the temperature designated in the table belongs only to an oceanic band 520 marine leagues in length, and comprised between the parallels of 11° and 19°. I dwell on these local circumstances, because the continental, like the liquid masses placed near the boundary of the tropical zone, between 21° and 23° of latitude, participate, during one part of the year, the climate of the temperate zone†. The north winds, between Cayman, cape Corientes, and the coast of Yucatan, tend not only to cool the air that rests upon the water, but cause also the counter-currents of the N. and N.W., which mix their waters in different latitudes. These accidental modifications of the normal temperature, characterize the latitudes near the tropic of Cancer; and are observed above all very frequently in the *Gulf of Mexico,* in that part of the Caribbean Sea which extends at the north of the Channel of Yucatan as far as the parallel 29½°, and which is nearly 54,000 square leagues. It results that this gulf is much more interesting for the study of the *giratory movement* of the currents that run along all these coasts, than for the determination of the mean temperature of a particular latitude. In another part of this work, I shall collect in tables the thermometric observations which I made between Vera Cruz, the mouth of the Mississippi, and the Havannah. It suffices to observe at present, that the temperature of the water of the gulf of Mexico is modified by the winds which reign at the mouth of the three *channels of communication,* that of the Yucatan, Bahama *, and Florida. The Caribbean Sea and the Gulf of Mexico form together the most immense basin of inland sea known in the whole world, a basin of 104,000 square leagues, and consequently 13,000 leagues more extensive than the Mediterranean which separates Europe and Africa. It is remarkable also, that the great axis of this basin runs like that of the Cordilleras of Veragua, of Guatimala and Mexico (I might add, like the coast of

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* The following are some explications on the observations that have been recently added to those I made during the passages of 1800 and 1801. M. Lucas Alaman, ancient secretary of state of the Mexican Confederation, went from Havre to la Desirade, and from thence to Vera Cruz, in January and February 1820. Captain Sabine, furnished with excellent chronometers, made the passage from the mouth of the Oroonoko to Jamaica and cape Saint Antonio, in September and October 1822. M. Boussingault, professor of chemistry at the school of mines of Bogota, observed the temperature of the water at sun-rise and at two in the afternoon, when the temperature of the air is at its minimum and its maximum, in crossing from Antwerp to Guayra, in November 1822. The observations of M. Martin, general agent of the French government at Mexico, were made on board the frigate Amphitrite, conjointly with M. Dupont, ensign, in going from Martinico to Vera Cruz, in February 1826. The thermometers employed by the French travellers were compared, before their departure, either with those of M. Gay-Lussac, or with those of the Observatory of Paris. All these results, with the exception of those of M. Sabine, have remained unpublished.

† Vol. vi, p. 553.

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* In the gulf of Uraba, or of Darien, and the gulf of Batabano.

† Vol. vii, p. 63.

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* *Canal viejo, Old Bahama Channel,* which communicates by the mouth of Santander, with the Channel of Florida.

South America, from cape Saint Roque to the mouth of the Oroonoko), from S.E. to N.W.

In examining the temperature of the surface of the water in the West Indian Sea, we recognize a double influence of season and latitude. The *maxima* (from 27° to 28°) are generally in February and March; the *minima* (from 25° to 26°) in November and December. The variations of the declination of the sun, the interval more or less long between the two passages by the zenith, and other causes which have been elsewhere enumerated, act at the same time on the air and water. The difference of the mean temperature of the air in the coldest and hottest months, are, on the southern shore of the West India sea, at Cumana for instance, 3°; towards the north, at 18° and 19° of latitude*, 4·5° to 5°. It thence results, that even in the latitudes where the monthly differences of atmospheric temperature are extremely small, the *extent of the variations*, as far as belongs to the seasons only, is still less in the water than in the air †.

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* *See* the differences of mensual temperature at Saint Domingo, Martinique, and Guadaloupe, in *Kirwan, Estimat des temp.*, p. 157; *Moreau de Jonnes, Hist. phys. des Antilles*, tom. i, p. 172 and 175. I have also examined the manuscript meteorologic journal of Doctor Albert, written at cape François, in 1803.

† Difference in the air at the border of the basin, 3·8°; in the water, 3°.

With respect to the influence of the latitudes, or rather of certain geographical positions, it is entirely owing to the currents, and to the mixture of the waters of different parallels. Researches carefully made on the numerical elements of climatology, have recently proved * that the mean annual temperature of the atmosphere differs in a manner scarcely sensible from the equator to the 10° of north latitude. From the latter parallel to that of 19°, the decrease of the heat does not probably exceed one degree, or one degree and a half of the centesimal thermometer. It is not, therefore, the difference of latitude, or the solsticial height, which can be manifested in the table of the temperature of the West Indian Sea, between the parallel 10° and 19°: they cannot be ascertained as we ascertain the influence of the

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* Mr. Brewster has confirmed (*Edinb. Journ. of Science, Jan.* 1827, p. 117-137), by interesting comparisons, my first assertion, that the equatorial temperatures little exceeded 27·7° (82° Fahr.). According to the communications of Mr. Harvey, the mean temperature of the air, at the island of *Ceylon*, is 27·1° (namely: Trincomalee, 26·9°; Pointe de Galle, 27·2°; Colombo, 27·0°; Kandy, 25·8°). The learned traveller, M. Reinwardt, found at *Batavia*, 27·7°. M. Moll, professor at Utrecht, fixes, for that place, 27·3°. Mr. Brewster admits for the equator, in Africa, 28·2°; in America and Asia, 27·5°. These numbers differ sensibly from 29·2°, the result which Mr. Atkinson had deduced from several theoretic suppositions. *See* vol. vii, p. 368, &c.

seasons. The water was sometimes found at 28·3° near the Great Cayman, and the same at 9° more southerly on the coast of the main land. If it happens that beyond 19°, between cape Negril, the Caymans, and cape Saint Antonio, we have more frequent examples of great lowering of temperature (25° to 24·5°) at the surface of the water, this must be attributed to the currents caused by the impulsion of the north winds, to a long interruption in the action of the sun on the surface of the sea, during tempests, and to the cooling of the atmosphere. I attribute to the latter cause the least part of the total effect; for, on the south of cape Saint Antonio, the air cools 18°, and not only in the gulf of Mexico but on the northern coast of Cuba, where the sky is covered during the northerly gales of wind, but also in some parts of the South Sea, where the air cools considerably with a serene sky, I ascertained the extreme slowness with which the atmosphere acts, by communication, on the great mass of water which it covers.

In treating of the distribution of heat, either in the sea or in the ethereal ocean, we must distinguish between the temperature locally produced, and the temperature coming from a distance by the movement of the air and water. It is natural, that near the channel where the West Indian sea communicates with the gulf of

Mexico, and consequently with waters that flow back, in their giratory movement, from 29° of latitude towards the surges of Florida, the rapid changes in the currents and winds should considerably vary the heat of the waters. I have marked by parentheses, in the table, the observations made under the particular influences of localities; and in fixing on those which give no rise to such suspicion, I find, for the *mean annual temperature of the West Indian sea*, 26·46°. We have seen above, that at different seasons, the oscillations round the mean temperature are 1·5°.

Let us compare at present, with the same care, the heat of an inland sea and the heat of the open ocean, bounded on one side by Africa, and on the other by the chain of the Little Antilles and the coast of South America. I cannot have recourse to the table of the Atlantic Ocean which I published in the first volume of this work *, because it neither presents a sufficient number of observations, nor of zones at equal spaces. To remedy this defect, I shall here mark 105 thermometric results, chosen in journals for the most part unpublished, and distributed in 5 and 5 degrees, from the equator to 45° of latitude. I collect, as much as possible, observations made in the same months, but in very different longitudes, or observations that correspond to months very distant from each other. The table which contains the partial observations is followed by that of the *mensual mean*, drawn separately from the months of winter and summer. The increase of this double series, from 45° of latitude to the equator, is very regular. What, in the *table of results*, is marked by the name of *limit number*, or *minimum*, of the mean annual temperature is, in an element deduced, not from all the months of winter and summer, but from a certain number of months among which we find the coldest and hottest of the year. General considerations and comparisons with the relations observed at an equal latitude, in the atmosphere of the continents, between the *mensual* temperature and the temperature of the whole year, prove that the annual temperature of the Ocean, such as the table presents it, is somewhat too little.

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* Vol. ii, chapter 3d, p. 69.

TEMPERATURE OF THE ATLANTIC OCEAN AT ITS SURFACE, IN THE ZONES OF 0° TO 45° OF NORTH LATITUDE.

ZONES.	SEASONS.	North latitude.	Longitude west of the meridian of Paris.	Temperature of the sea. *Th. cent.*	REMARKS.
45°	January	46° 49′	11° 52′	11·2°	Alaman, 1820.
	January	46 10	11 55	12·2	Martin and Dupont, 1826.
	January	45 11	17 37	12·9	Baudrand, 1826.
	June	44 50	13 39	16·2	*Idem.*
	October	44 31	24 2	16·7	Freycinet, 1820.
	May............	44 20	28 54	15·0	Quevedo, 1803.
	June	44 20	13 7	16·0	Humboldt, 1799.
	January	44 0	11 40	12·9	Sabine, 1822. (Rennel, 11·4°.)
40°	January	40° 46′	19° 16′	15·9°	Alaman, 1820.
	January	40 32	18 20	13·3	Martin, 1826.
	October	40 25	29 38	19·7	Freycinet, 1820.
	June	40 12	30 57	19·1	Baudrand, 1826.
	May..................	40 0	32 46	17·7	Quevedo, 1803.
	June	39 10	16 18	15·0	Humboldt, 1799 (north wind).
	January	39 2	24 9	15·2	Baudrand, 1826

TEMPERATURE OF THE ATLANTIC OCEAN AT ITS SURFACE, IN THE ZONES OF 0° TO 45° NORTH LAT.—*(Continued)*.

ZONES.	SEASONS.	North latitude.	Longitude west of the meridian of Paris.	Temperature of the sea. *Th. cent.*	REMARKS.
35°	December	36° 38′	74° 40′	16·9°	Sabine, 1822, beyond the Gulf-stream.
	January	35 50	20 40	17·0	Martin and Dupont, 1826.
	January	35 46	24 52	15·8	Alaman, 1820.
	October	35 16	10 25	23·5	Churruca, 1788.
	June	35 8	17 15	16·2	Humboldt, 1799.
	June	35 2	50 4	25·9	Baudrand, 1826.
	December	35 4	77 14	(25·2)	Sabine, 1822, in the Gulf-stream.
	May.................	34 50	41 10	18·8	Quevedo, 1803.
	October	34 52	11 26	23·7	Morris, 1807.
	October	34 50	35 34	22·5	Freycinet, 1820.
	January	34 49	29 28	18·9	Baudrand, 1826.
30°	May...................	30° 46′	38° 45′	20·5°	Quevedo, 1803.
	October	30 39	36 1	24·8	Freycinet, 1820.
	January	30 33	32 27	20·1	Baudrand, 1826.
	March	30 32	19 21	16·3	Dirckink, 1824.
	November	30 15	19 7	23·4	Boussingault, 1822.
	January	30 5	23 45	18·3	Martin and Dupont, 1826.
	January	30 2	30 20	18·1	Alaman, 1820.
	June	29 41	52 26	27·5	Baudrand, 1826.
	October	29 20	22 25	24·4	Morris, 1807.
	June	29 18	16 40	19·3	Humboldt, 1799.
	November	28 33	74 36	22·2	Morris, 1807.

TEMPERATURE OF THE ATLANTIC OCEAN AT ITS SURFACE, IN THE ZONES OF 0° TO 45° NORTH LAT.—(*Continued*).

ZONES.	SEASONS.	North latitude.	Longitude west of the meridian of Paris.	Temperature of the sea. *Th. cent.*	REMARKS.
25°	October	26° 8′	35° 54′	26·2°	Freycinet, 1820.
	May........	25 49	26 20	20·7	Perrins, 1800.
	April	25 29	39 54	21·6	Quevedo, 1803.
	November	25 20	81 57	26 9	Sabine, 1822.
	January	25 15	32 49	20·6	Alaman, 1820.
	June	25 15	20 17	20·0	Humboldt, 1799.
	October	25 4	23 13	22·4	Freycinet, 1817.
	November	25 3	68 3	26·1	Morris, 1807.
	November	25 0	20 0	24·5	Boussingault, 1822.
	June	24 57	59 59	27·6	Baudrand, 1826.
	January	24 48	36 24	22·7	*Idem.*
	January	24 30	21 0	19·4	Sabine, 1822 (Rennell, 20·2°).
	September	24 26	22 27	23·9	Duperrey, 1822.
	November	24 21	32 10	25·0	Morris, 1807.
	January	24 18	32 50	21·5	Martin and Dupont, 1826.
	April	24 16	22 17	19·1	Dirckinck, 1821.

TEMPERATURE OF THE ATLANTIC OCEAN AT ITS SURFACE, IN THE ZONES OF 0° TO 45° NORTH LAT.—*(Continued.)*

ZONES.	SEASONS.	North latitude.	Longitude west of the meridian of Paris.	Temperature of the sea. *Th. cent.*	REMARKS.
20°	January	21° 43′	38° 23′	23·6°	Baudrand, 1826.
	January ... ,..... ..	21 39	22 30	24·3	Chappe, 1768.
	June	20 43	64 12	28·2	Baudrand, 1826.
	October	20 42	34 47	26·5	Freycinet, 1820.
	November	20 33	35 49	26·1	Boussingault, 1822.
	January	20 20	49 34	24·0	Martin and Dupont, 1826.
	November	20 20	26 26	23·8	Freycinet, 1817.
	June	20 8	28 51	21·2	Humboldt, 1799.
	January	19 59	45 3	23·4	Alaman, 1820.
	April	19 53	41 52	23·3	Quevedo, 1803.
	September	19 47	25 40	24·9	Duperrey, 1822.
	January	19 20	25 10	21·3	Sabine, 1822.
	April	19 3	24 57	21·3	Dirckinck, 1824.

TEMPERATURE OF THE ATLANTIC OCEAN AT ITS SURFACE, IN THE ZONES OF 0° TO 45° NORTH LAT.—*(Continued).*

ZONES.	SEASONS.	North latitude.	Longitude west of the meridian of Paris.	Temperature of the sea. *Th. cent.*	REMARKS.
15°	September	17° 51′	27° 27′	25·6°	Duperrey, 1822.
	February	16 11	58 56	25·2	Martin and Dupont, 1826.
	January	15 29	42 10	23·9	Baudrand, 1826.
	April	15 24	39 45	23·8	Quevedo, 1803.
	July..................	15 18	42 21	23·0	Humboldt, 1799.
	November	15 4	51 4	27·2	Boussingault, 1822.
	October	14 28	27 44	25·2	Freycinet, 1817.
	November	14 14	30 11	27·6	*Idem*, 1820.
10°	September	11° 6′	25° 46′	26·1°	Duperrey, 1822.
	July..................	10 46	60 54	25·8	Humboldt, 1799.
	November	10 38	25 44	26·5	Freycinet, 1817.
	October	10 16	22 25	26·4	Churruca, 1788.
	April	10 12	26 50	28·2	Rodman, 1803.
	March	10 7	24 30	23·8	Perrins, 1804.
	October	9 48	26 26	27·8	Freycinet, 1820.
	April	9 37	24 58	25·0	Dirckinck, 1824.
	January	9 29	46 1	25·6	Baudrand, 1826.
	April	9 23	36 51	26·6	Quevedo, 1803.
	September	8 54	23 22	26·0	Duperrey, 1822.

TEMPERATURE OF THE ATLANTIC OCEAN AT ITS SURFACE, IN THE ZONES OF 0° TO 45° NORTH LAT.—(*Continued.*)

ZONES.	SEASONS.	North latitude.	Longitude west of the meridian of Paris.	Temperature of the sea. *Th. cent.*	REMARKS.
5°	November	5° 28′	25° 10′	28·8°	Rodman, 1803.
	October	5 28	26 3	27·3	Freycinet, 1820.
	March	5 18	22 33	26·5	Perrins, 1804.
	September	5 18	52 49	27·5	Sabine, 1822.
	November	5 10	24 52	26·5	Freycinet, 1817.
	October	5 9	22 27	28·3	Churruca, 1788.
	April	5 6	24 42	27·5	Dirckinck, 1824.
	September	5 6	21 38	26·0	Duperrey, 1822.
	May....................	5 0	4 42	(29·0)	Sabine, 1822.
	April	4 52	33 19	26·6	Quevedo, 1803.
	January	4 33	48 57	27·3	Baudrand, 1826.
0°	September	1° 14′	25° 3′	24·5°	Duperrep, 1822.
	September	0 55	12 0	23·3	Wales, 1772.
	November	0 35	30 43	25·5	Freycinet, 1817.
	September	0 21	48 18	26·4	Sabine, 1822.
	April	0 17	30 20	27·7	Quevedo, 1803.
	May....................	0 16	8 34 E.	28·1	Sabine, 1822.
	March	0 15	22 21	28·2	Perrins, 1804.
	April	0 14	25 34	27·7	Dirckinck, 1824.
	November	0 2	25 37	27·5	Churruca, 1788.

RESULTS; MEAN TEMPERATURE OF THE NORTHERN ATLANTIC OCEAN AT ITS SURFACE.

Latitudes North.	MEAN TEMPERATURE.		Mean temp. of the year. Limit number of the minimum. (Sea.)	INSULATED OBSERVATIONS.		TEMPERATURE OF THE CONTINENTAL AIR. (Numerical elements serving for comparison to the preceding results).
	WINTER MONTHS. (Sea.)	SUMMER MONTHS. (Sea.)		MINIMUM.	MAXIMUM.	
45°	January ...... 12·3°	May, June ....15·9°	14·0°	11·2°	16·7°	MILAN, lat. 45° 28′; annual mean time, 13·2°; mean time of January, 2·3°; of May and June, 19·8°.
40	January........14·6	May, June ....18·8	16·7	13·3	19·7	ROME, lat. 41° 53′; an. mean time, 15·5°; January, 7·6°; May and June, 20·2°.
35	Dec.-Jan.......16·5	June-Oct.......21·3	18·9	15·8	25·9	PALERMO, lat. 38° 6′; an. mean time, 17·5°; January, 11·2°; May and June, 20·0°; June and October, 22·6°.
30	January.........18·7	June-Nov. ......23·5	21·0	16·3	27·5	CAIRO, lat. 30° 2′; an. mean time, 22·4°; January, 13·4°; June and Nov., 27·1°.
25	Jan.-April......20·7	Sept.-Nov. ....25·3	23·0	19·1	27·6	SAINT CROIX OF TENERIFFE, lat. 28° 29′; an. mean time, 21·5°; January, 17·6°; Jan.-April, 18·6°; June-Nov. 23·9°.
20	Jan.-April......22·8	June-Nov. ....25·9	24·3	21·3	28·2	HAVANNAH, lat. 23° 9′; an. mean time, 25·7°; Jan.-April, 23·4°; Sept.-Nov., 25·2°.
15	Jan.-April......24·3	July-Nov.......24·6	24·5	23·8	27·2	
10	Jan.-April......25·8	July-Nov.......26·2	26·0	23·8	27·8	CUMANA, lat. 10° 27′; an. mean time, 27·6°; Jan.-April, 27·3°; July-Nov., 27·7°.
5	Jan.-April......27·1	Sept.-Nov. ......27·3	27·2	26·5	28·3	
0	March-May ....27·9	Sept.-Nov. .....25·6	26·7	23·3	28·4	SAN LUIS DE MARANHAM, an. m. t., 27·4°.

The *numerical elements* of the preceding table* are chosen from more than seven hundred observations of temperature made in the Northern Atlantic Ocean. I was obliged to assemble and rectify a great number of materials to extend my labors on the isotherm lines. The greater part of the surface of the globe being covered with water, the temperature of the water, in the different seasons of the year, the relative position of seas and currents, and the direction of the prevailing winds that transport the temperature from one zone to another, are the three most important causes which determine the climates. If 8000 observations scarcely suffice to fix the mean temperature of the months in a given spot of the continent, a very small number of observations made at sea, furnish very precise results on the variations which the Ocean undergoes at different seasons and in different latitudes. Many journals tend to prove, what my own experience confirms *, that, in a space surpassing the extent of France,

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* We must add to the journals already mentioned above, p. 404, note 1, as sources from which the *numerical numbers* of this table have been drawn : the two manuscript journals of M. Morris, commanding the American sloop the *Hornet,* and of M. *Quevedo,* captain of a ship, commanding the *Rufina,* and who in his voyage from Callao de Lima to Cadiz, made use of thermometers compared with mine; and the observations already published of Wales, Rennell, Chappe, Rodman, Perrins, and Churruca.

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* In the South Sea, I found, in plunging the centesimal thermometer daily in the water, at different hours of the day, that, on a length of 560 marine leagues, the temperature of the surface did not vary 2·2°. From lat. 0° 35′ south (long. 84° 43′) to lat. 16° 57′ north (long. 102° 51′), the temperature was 27·2° to 29·4°. The following are other examples of this admirable uniformity in the distribution of heat in the Ocean at its surface: M. *Dirckinck de Holmfeldt,* of whose observations I possess 600 made in the Atlantic Ocean and the South Sea, with a thermometer compared with those of M. Gay-Lussac, from lat. 32° 45′ N. (long. 17° 47′) to lat. 28° 55′ (long. 20° 35′); in May, 16·4° to 18·2°. (Difference of the heat of the Ocean in that space, 1·8°.) The same observer, from lat. 2° 26′ N. (long. 24° 18′) to lat. 22° 56′ S. (long. 41° 15′), in April, 26·2° to 27·7°. (Diff., 1·5°.)—M. *Quevedo,* from lat. 23° 23′ S. (long. 28° 57′) to lat. 9° 23′ N. (long. 36° 51′), in March, 26·2° to 27·3°. (Diff., 1·1°.) The same observer, from lat. 40° 28′ N. (long. 35° 35′) to 44° 15′ N. (long. 26° 26′), in May, 15·0° to 17·7°. (Diff., 2·7°.)—M. *Boussingault,* from lat. 18° 54′ N. (long. 41° 17′) to 11° 37′ N. (long. 59° 49′); in November, from 26·6° to 27·9°. (Diff., 1·3°. Thermometer compared with that of the Royal Observatory of Paris.)—MM. *Martin* and *Dupont,* from lat. 21° 15′ N. (long. 40° 20′) to lat. 17° 40′ N. (long. 55° 35′); in February, from 23·0° to 24·2°. (Diff., 1·2°. Thermometer compared with those of M. Gay-Lussac.)—General *Baudrand,* from lat. 46° 42′ N. (long. 15° 55′) to 41° 32′ N. (long. 20° 15′); in January, from 12·8° to 14°. (Diff., 1·2°.) The same observer, from lat. 31° 10′ N. (long. 40° 20′) to lat. 17° 40′ N. (long. 55° 35′); in February, from 23·2° to 24·3°. (Diff., 1·1°. Thermometer compared to those of M. Arago.)

the temperature of the Ocean remains the same in a given month, from 1·2° or 2° nearly. The same journals shew, that in the same pelagic zones, the difference the months attain, from the equator to 35° of north latitude, is scarcely 4° to 5°. On the continents, for instance, in 45° of north latitude, the mean temperature of the months of January and of June differ 20°; when, in the Atlantic Ocean, in the same parallel, those months differ only 3·6°. The temperature of the continental air, is often, in the hottest season, by day, between the tropics, from 7° to 9° higher than at night. At sea, the influence of the hours is so small, that for a long time it was altogether doubtful *. In order to verify the observations of M. John Davy, in his voyage from England to Ceylon, I engaged several of my friends to observe the heat of the air and water at different periods of the day and night. The most complete table of this kind of observations is that which I owe to the zeal of M. Dirckinck, a lieutenant of the ship, who made a regular observation in the two hemispheres, at nine in the morning, noon, six in the evening, and midnight. As the vessel does not remain in one point, it might be feared that the observations were affected by the influence of change of place;

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* *See* above, vol. ii, p. 72.

but this doubt disappears when we see the same temperature return at the same hours during four or five days successively, in passages of 150 to 200 leagues. We must rather mistrust observations in time of calm, in the open sea, or at anchor in a port. In the former case, the least change in the liquid varies the high temperature; in the latter, in a road or in the ports, the tides * and the unequal heat of the shore with which the sea is in contact, cause periodical variations that are altogether local. The whole of the thermometric observations of Dirckinck give 0·76° for the difference of the temperature of the sea at noon and at midnight. The extremes were, in the same day, 0·3° to 1·2°. The heat often did not diminish in the night, although the temperature of the atmosphere had lowered 3°. The excellent observations of M. Boussingault give, for sunrise and two in the afternoon, in November: mean difference of the sea water, 0·52°; mean difference of the air, on the same days, 1·4°. The extreme limit of the temperature, in twenty-four hours, was 0·11° and 0·74°. Lieutenant Colonel Wilson continued his researches at my request in the passage of the steam-vessel, the *Enterprize*, from Falmouth to Bengal. The following are the results of this observer: mean difference of the temperature of the sea, at two in the afternoon and at sun-rise, from August to December, 0·9°; *maximum*[*] of the temperature of the sea, 29·4° lat. 8° 42′ south, long. 88° 37′ east, the air being 28·3°; the greatest difference between the air and the sea, when the temperature of the air was higher than that of the Ocean, 4·48° in August, lat. 39° 17′ south; when the temperature of the air was lower, in October, 3·08°, lat. 33° 13′ south; *maximum* of the temperature of the atmosphere during the whole voyage, 30·2°; mean variation of the temperature of the air, in twenty-four hours, 1·6°. It must not be forgotten, in discussing the whole of the results communicated by Colonel Wilson, that they are drawn from observations made on the north and south of the equator, in the temperate and tropical zones. In examining my different journals of the Atlantic, the West Indian Sea, and the Pacific Ocean, I find, in the tropical zone, from sun-rise to three in the afternoon, for the augmentation of the temperature of the air[†], 0·8°

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* Vol. ii, p. 144, 176.

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[*] Vol. vii, p. 368.

[†] I chose days that were entirely calm, or when there was only a light breeze. The instruments in *the wind*, and removed several feet from the body of the vessel, of which the heat might cause great errors. The partial differences amounted to 1·8°, and even to 2·4° (*see*, for instance, above, vol. ii, p. 143; but these anamolies are rare. The appear-

to 1·3°. M. Arago, who has employed himself in these researches, has shewn that such an augmentation proves that the absorption of the rays of the sun in its passage across the different layers of the atmosphere, is much more considerable than has hitherto been believed. In the middle of the Ocean, the increase of the heat of the air, after the passage of the sun over the meridian, can only be owing to the extinction of light in the air; for, according to the observation of the great philosopher I have just named, this increase is observed even in circumstances when the water is less warm than the air. The extent of the mensual oscillations of the temperature in the vast basin of the seas, is, in the temperate zone, at 45° of latitude, a fifth; and between the tropics, a third less in the water than in the air. The surface of the water is not enough heated during the day,

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ance of the sun at the horizon, generally agitates the atmosphere a little; I therefore preferred making the observation at sea half an hour later. The difference of nine in the morning and noon is so small, *on the right sphere,* that navigators who have chosen these periods, have been only able to estimate a very small part of the phenomenon. As the course of this discussion relates to very small numeric elements, it may be useful to remind the reader, that half a degree of the scale of Fahrenheit is equivalent to 0·28° of the centesimal thermometer, and that the doubts which may sometimes be raised on the absolute estimations, do not extend to relative or differential estimations.

because the upper layers are mixed with the lower, by the movement of the waves; and the effect of the reflection is diminished during the night, because the cooled molecules descend. There is a tendency in the water to preserve an uniform temperature. Between the equator and 48° of north and south latitude, the water is hotter than the air. M. Duperrey, in examining, at my desire, the number of times that the air was hotter than the water, far from the coast and beyond the tropics, in the expedition round the world, found, the relation of this number with that which gives an inverse result, at night, 3 to 1; by day, 2 to 1; at noon, 1·3 to 1 *. These three reports between the

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* On 167 observations made in two voyages round cape Horn, by MM. Quevedo and Dirckinck, in March and November, when at 56° and 39°, the water was from 2° to 3°, the air, south of the parallel of 35°, was 77 times hotter than the sea, which may be attributed to the current of the south pole. During my passage from the coast of Europe to America, the relation in the temperate zone, was 1 : 2. General Baudrand found, in January, 1 : 5; M. Martin, in January also, 1 : 9. The tropical relation for M. Quevedo, was 1 : 38; for General Baudrand, 1 : 32; for M. Boussingault, 1 : 16; for me, 1 : 12. M. de Freycinet, in examining the immense number of observations collected during the voyage of the *Uranie*, finds also that the water is generally hotter than the air, with the exception of the sea of Japan, S.E. of Madagascar. Beyond the tropics, the heat of the air above that of the water is found in observations made at noon only.

tropics, were made on 1314 observations, 6 to 1; 4 to 1; and 1·4 to 1. In the equatorial region, the maximum of the difference between the water and the air takes place generally before sun-rise; it is, mean term, from 1·2° to 1·6°; but the sea, at two in the afternoon, is often scarcely 0·4° to 0·6° hotter than the atmosphere; and therefore, the excess of the temperature of the air above that of the water, happens much more frequently from noon till two, than at hours nearer sun-rise or sun-set. We see, by the whole of these facts, that the habitual state of the Ocean, from the equator to the 46° of north and south latitude, is that in which the liquid surface is hotter than the atmosphere that covers it. Between those limits, the sea tends constantly to heat the air; and this heating effect is not confined, as is generally imagined, to some months of winter; it is manifested during the whole year, because the number of hours when the sea is hotter than the air, greatly exceeds * the number when the tempe-

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* The assertion of M. Kirwan (*Estim. de la temp.*, p. 47), so often repeated in other works, "that water is *generally* colder in summer than the atmosphere that reposes on the sea," is not correct. It is not always so even from noon till two in the afternoon, although the *air of the sea*, filled with vesicular vapours, is less diaphanous, and often absorbs the solar rays better than *continental air* during the serene days of summer.

rature of the atmosphere is higher than the temperature of the Ocean.

In examining the table of partial observations, we see that from 30° to 45° between the parallels of Cape de Geer and Bourdeaux, the temperature of the Atlantic at its surface, changes not only with the latitude and the seasons, but also with the longitude. The great pelagic river known by the name of the *Gulf-stream*, produces that effect: it is more sensible south of 35°, where the current is nearest the coast of the United States, than at the north of the Azores islands, where, flowing towards the coast of Ireland, it loses something of its temperature by spreading itself. If we study the *mean annual temperature* of the different zones of the northern Atlantic Ocean, we may remark that it differs little from that of the eastern coast, while it is higher than that of the western. The Atlantic, and this fact is very important for the physical history of our planet, belongs to the system of climates that verge on the western part of the Ancient Continent. The hot waters of the *Gulf-stream* give it this advantage, from which the cisalleghanian regions of the great Confederation of North America would profit more, if the air that reposes on the Ocean took the temperature of the water, and, if north of the parallel of 35° the east winds were more frequent than the west.

Milan, Rome, Palermo, Cairo, Saint Croix of Teneriffe, and the Havannah, six points of which the climate is known by a great number of precise observations, can furnish us by interpolation * with the mean temperature of the

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* In order to enable the reader constantly to make the calculations himself that are founded on a knowledge of facts, I repeat, that the mean temperature of the continental atmosphere is that which I marked above (p. 501), and which is founded on the numerous observations of M. Reggio (1787-1812), for Milan; of MM. Calandrelli, Guillaume de Humboldt, and Schouw, for Rome; M. Marabitti, for Palermo; MM. Niebuhr, Nouet, and Coutelle, for Cairo; MM. Escolar and Leopold de Buch, for Saint Croix de Teneriffe; and M. Ferrer for the Havannah. The mean temperature of Cairo being probably a little higher than it ought to be according to the latitude of the place, I took (in the *system of climates* of the western parts of the Ancient Continent), the mean of Cairo and Saint Croix de Teneriffe, and sought, by this mean and the Havannah, the correspondent temperature to the latitude of 25°. As the southern lines, near the tropics, become parallel to the parallels of the equator, the Havannah, notwithstanding its western position, could serve for the term of interpolation. If it be objected, that the given number in the table of results, indicating by approximation the mean annual temperature of the sea water, are not deduced from all the months of the year, but only five or six, I shall observe that the error of these numbers must be very small, because the temperature of winter and summer are taken from months grouped around the annual *minima* and *maxima*, January and July. The results on which I fixed, and which I shall rectify in another work, are, as the table indicates, *limit numbers* at the *minimum*. The following are the proofs of what I advance:

continental air between 45° and 25° of latitude. It is that part of the atmosphere which we shall here compare with the temperature at the surface of the Ocean.

LATITUDE.	Continental Air in the western part of the Ancient Continent.	Atlantic Ocean (water).	Continental Air in the eastern part of the New Continent.
25°	24·4°	23·0°	
30	22·0	21·2	19·4°
35	19·3	18·8	16·0
40	16·5	16·7	12·5
45	13·0	14·0	8·2

It is probable, that on the north of the parallel of 45°, above all between this parallel and

mean time at Paris, in five years, taken at hazard (1816, 1818, 1820, 1821, 1826), in selecting the hottest and coldest months; ½ (2·6° + 15·6°) or 9·1° (vr. 9·3°); ½ (2·1° + 20·1°) or 11·1° (vr. 11·3°); ½ (0·7° + 18·7°) or 9·7° (vr. 9·8°); ½ (3·1° + 20·1°) or 11·6° (vr. 11·0°); ½ (1·7° + 21·2°) or 11·4° (vr. 11·4°). These comparisons give, in taking a great number of years, for Milan, ½ (0·5° + 23·7°) or 12·1° (vr. 13·2°); Rome, ½ (7·6° + 23·7°) or 15·6° (vr. 15·5°); Palermo, ½ (11·3° + 24·7°) or 18·0° (vr. 17·4°); Cairo, ½ (13·4° + 29·7°) or 21·6° (vr. 22·4°). The limits of the errors become still less if we employ three months of winter and three months of summer.

that of 65°, the mean annual temperature of the sea is higher than that of the continental air of the lands on the east. In the westerly lands, in the *system of climates* of eastern America, the temperature corresponding to 30°, 35°, 40°, and 45°, is approximatively 19·4°; 16·0°; 12·5°; 8·2°. The mean annual temperature of the Atlantic Ocean, between the parallel of cape Hatteras and New Scotland, between 35° and 45° of latitude, is consequently, in its whole extent, from 3° to 6° higher than the mean annual heat of the air which reposes on the eastern part of the New Continent. The coincidence of the numeric elements, for the most part, which express the mean temperature of the sea in different zones, in my work, with the figures furnished by the table of Kirwan, is the more remarkable, as the results were by methods altogether different. I employed, in a direct manner, for every zone, the temperature observed in the coldest and hottest months; while Kirwan only made use of two observations corresponding with the parallels of 40° and 50°. He found every other temperature by the rule of the square of the sine of the latitudes. The errors of the formula of Mayer are in fact inconsiderable, as far as the parallel of Paris, when the observations are confined to the same *system of climates*, that is, when we follow the meridians which pass by the concave or convex summits of the isotherm lines; but the errors of this formula augment prodigiously, either in confounding the different *systems of the climates*, or in advancing, in the same longitude, reckoning from the meridian which passes, by one of the summits of the isotherm curves, in 50° of latitude towards the pole. In the actual state of the theory of heat, it is prudent to adhere to the simple results of observation, and have recourse to interpolations only between points very near each other. If, in 45° of latitude, the western parts of the Ancient and the eastern parts of the New Continent, differ only 5·8°, in the mean temperature of the year, this difference rises, between the 69° and 73° of north latitude, on the parallel of the isle Igloolisk and port Bowen, to 15° and 16° of the centesimal thermometer.

After having taken a general view of the basin of the Atlantic, and compared the mean annual temperature of the water with the temperature of the continental air near the coast of the Ocean, it remains for me to examine the distribution of heat at different seasons. We are at first surprised at the high temperature (12·3°) observed in the open sea, in the month of January, at 45° of latitude, when, on the continent of Europe, the mean temperature of that month lowers, at Milan, to 0·5°; at London, to 3·2°; at Brest, to 6°. It results from a great number of observations which I collected, that the winter temperature of 10° to 11° is preserved in the Atlantic, far from the coast, to the parallel 47° and 48½°; and, the surface of the sea in those latitudes, being habitually, in July and August, from 15° to 17°, the mean annual temperature of the sea is at least 13·5°; while, on the continent, in the same parallel, the annual temperature of the air is only 10·8°. The Ocean in those latitudes, not only tends to equalize the temperature of the coast at different seasons, but contributes also to raise it; for, if in July and August, the continental air is 3·5° more elevated than the surface of the sea, the temperature of that air in the month of January, exceeds 9° that of the inland country. The continents profit in winter, from the high temperature of the seas, by the winds which are heated by their contact with the water, and by the vapours which condense and transport the caloric from the sea towards the coast. Even at 65° and 70° of north latitude, the mean annual temperature of the surface of the Ocean is (according to MM. Rennell and Sabine), 5·5°, or very near the *maximum* of the density of the water; when, on the same parallel, the mean temperature of the air, at Uleo, Umeo, and Enontekiës, is + 0·6° to — 2·8°. Such is the influence exerted by the basin of the sea, that vast liquid surface, in which the molecules of water could by reflection descend towards the bottom, on the augmentation of the mean temperature of the globe.

The extent of the oscillations, or the difference of the mean *maxima* and *minima* of summer and winter, is, in the sea, at 30° and 45° of latitude, 8·6° to 4·8°; in the continental air, it rises, in Europe, to 15°; in America, to 22°. Between 35° and 20° of latitude, between the parallels of the Açores and cape Blanc, we observe in the preceding table, the influence of more western longitude, and a great equality of temperature, when navigators have passed by the same latitudes, in different zones, in corresponding seasons *. On the south of the tropic of Cancer, in the great valley of the Atlantic, as well as in the West Indian Sea, the changes in the declination of the sun act on the heat of the water only by deranging the atmospheric equilibrium between the northern and southern hemisphere, and by modifying the limits of the trade-winds and currents. Two passages of the sun at the zenith, at periods more or less distant, render the climateric bipartition of the year illusory.

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* Compare, for instance, my observation, lat. 35° 8′ with that of General Baudrand, lat. 35° 2′, but 33° of longitude more westerly; the observations of M. Freycinet, in October 1817 and 1820, lat. 25° 4′ and 26° 8′ together, and with the observation of M. Duperrey, commanding the sloop *la Coquille*, lat. 24° 26′; my observation, lat. 20° 8′, and that of General Baudrand, 36° of longitude more to the west; the observations of M. Freycinet, in 1820, and of M. Boussingault, in 1822, made in autumn, almost in the same latitudes, lat. 20° 42′ and 20° 33′, long. 34° 47′ and 35° 49′. The heat of the waters generally augments towards the west; in the high latitudes, because we approach the *Gulf-stream*, which widens; and in the low latitudes, at 25° of western longitude, because the currents between Gambia and the Guyana bear to the N.W. and bring the waters of the zone at 4° to 6° towards more northern latitudes.

In comparing the basin of the West Indian Sea and that of the Atlantic Ocean in the corresponding limits of 10° to 20°, we find the open sea is less warm than the inland sea. We are above all astonished at the low temperature of the waters (21·3° to 23·8°) in the parallel of cape Vert and cape Maria, between 15° and 19° of latitude. At the equator, and at some degrees to the north, the great channel that separates Africa from Brazil, presents also very remarkable variations of heat. The gulf of Guinea, like that of Panama, belongs to the hottest pelagic regions (from 28° to 28·8°) known in the equinoxial region. In advancing towards the west from the meridian of Paris to the 15° and even 25° of western longitude, Wales, Sabine, and Duperrey found the water of the surface, in July and September, at 22·2°, 23·3°, and 24·5°. A very extraordinary cooling for a region of the Ocean near the equator, and at more than 200 leagues distant from the continent *. It is rightly attributed to the currents which flow with force from the southern temperate zone. Captain Sabine has recently proved that the thermometer may indicate to the navigator the limit between the hot waters of the current of Guinea which is borne to the south-east, and the colder waters of the current of the Atlantic, of which the direction is diametrically opposite. We must not suppose, however, that the low temperature of 22½° to 24½° belongs to all the seasons and to the whole channel. MM. Perrins and Dirckinck found the waters of the Atlantic, in March and April, near the meridian of 22° and 26°, at 27·7° and 28·2°. In the same longitude, but 5° further north, Rodman observed the *maximum* to be 28·8°. No person has I believe found the thermometer higher in the basin which we are now examining. The extreme temperature of 30° and even of 30·6° have been observed, far from the coast, and by a fresh breeze, only in the

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[*] During the whole voyage of the *Urânie* round the world, commanded by M. de Freycinet, the temperature of the equatorial Ocean was never found below 20·7°, and even that temperature was only observed towards the extremity of the tropical zone, nearly east of Rio Janeiro, lat. 22° 13′ south, and long. 26° 45′, therefore at more than 100 leagues from the isle Martin Vaz. (Compare also *Sabine, Pend.*, p. 441.)

South Sea. I here conclude the discussion of the *numerical elements* which the Climatology of the Ocean presents. I thought it was proper to resume these general considerations before I advance anew in the main land. I did not again see the horizon of the Ocean till after an absence of eighteen months, from the height of the Cordilleras of Peru, in descending the Andes of Guangamarca, in the southern hemisphere. At that period of my voyage, I shall examine whether, at the south of the equator, in equal latitudes, the mean annual temperature of the waters of the Ocean be less elevated than in the West Indian Sea.

* * *

Our passage from the island of Cuba to the coast of South America terminated at the mouth of the *Rio Sinu,* having lasted sixteen days. The road in which we anchored near the Punta del Zapote, afforded very bad anchorage, and in a rough sea and with a violent wind, we found some difficulty in reaching the coast in our canoe. How beautiful this land appeared to us! such it must appear to the few travellers who, sensible of the charms of nature, at the aspect of a thick forest, crowned with palm-trees, do not measure their enjoyments by the civilization of the places where they disembark!

Every thing denoted that we had reached a savage region rarely visited by strangers. Some scattered houses form the village of Zapote: we found a great number of mariners assembled under a sort of shed, all men of colour, who had descended the Rio Sinu in their barks, to carry maize, bananas, poultry, and other articles of consumption, to the port of Carthagena. These barks, which are fifty to eighty feet in length, belong for the most part to the planters *(haciendados)* of Lorica. The value of their freight amounts, in the largest embarcations, to 2000 piasters. These boats are flat-bottomed, and cannot keep at sea when it is much agitated. The *breezes* from the N.E. had during ten days blown with violence on the coast, while, in the open sea, as far as 10° of latitude, we had only had slight gales, and a sea constantly calm. In the aëreal, as in the pelagic currents, some layers of fluids move with extreme swiftness, while others near them remain almost motionless. The *zambos* of the Rio Sinu fatigued us with idle questions on the purpose of our voyage, our books, and the use of the instruments: they regarded us with mistrust, and in order to escape from their importunate curiosity, we went to herbalize in the forest, although it rained. They had tried, as usual, to frighten us with stories of Boas *(Traga-Venado)*, vipers, and the attacks of jaguars;

but during a long residence among the Chaymas Indians of the Oroonoko, we were habituated to these exaggerations, which arise less from the credulity of the natives, than from the pleasure they find in tormenting the whites. Quitting the coast of Zapote, covered with paletuviers[*], we entered a forest remarkable for a great variety of palm-trees. We saw the trunks of the *Corozo del Sinu*[†] pressed against each other, which formed heretofore our species Alfonsia, yielding oil in abundance; the Cocos butyracea, called here *Palma dulce* or *Palma real*, and very different from the *Palma real* of the island of Cuba[‡]; the *Palma amarga*, with fan-leaves that serve to cover the roofs of houses, and the *Latta*[§] resembling the small

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[*] Rhizophora Mangle.

[†] In Spanish America, palm-trees with leaves, the most different in kind and species, are called Corozo: the *Corozo of Sinu*, with a short, thick, glossy trunk, is the Elæis melanococca of M. Martius (*Palm.*, p. 64, Tab. xxxiii, lv). I cannot believe it to be identic with the Elæis guineensis (*Herbal of Congo River*, p. 97), since it vegetates spontaneously in the forests of the Rio Sinu. The *Corozo of Caripe* is thin, small, and covered with thorns; it approaches the Cocos aculeata of Jacquin. The *Corozo de los Maranos* of the valley of Cauca, one of the tallest palm-trees, is the Cocos butyracea of Linnæus. See Kunth, in *Humb. and Bonpl., Nov. Gen.*, tom. i, p. 301-315.

[‡] *See* above, p. 350.

[§] Perhaps of the species of Aiphanes.

Piritu Palm-tree of the Oroonoko. This variety of palm-trees was remarked by the first *Conquistadores* *. The Alfonsia, or rather the species of Elæis, which we had no where else seen, is only six feet high, with a very large trunk; and the fecundity of its spathes is such that they contain more than 200,000 flowers. Although a great number of those flowers (one tree furnishes 600,000 at the same time) are avortious †, the soil remains covered with a thick layer of fruits. We have often made the same observation under the shade of the Mauritia palm-tree, the Cocos butyracea, the Seje, and the Pihiguao of the Atabapo. No other family of arborescent plants is so prolific in the development of the organs of flowering. The almond of *Corozo del Sinu* is peeled in the water. The thick layer of oil that swims in the water is purified by boiling, and yields the *manteca de Corozo,* which is thicker than the oil of the Cocoa-tree, and serves to light churches and houses. The palm-trees of the section of *Cocoinies* of Mr. Brown, are the olive-trees of the tropical region. As we advanced in the forest, we began to find little pathways that appeared to be recently cut out with the hatchet. Their windings displayed a great number of new plants: Mougeotia mollis, Nelsonia albicans, Melampodium paludosum, Jonidium anomalum, Teucrium palustre, Gomphia lucens, and a new kind of Composées, the Spiracantha cornifolia. A fine Pancratium embalmed the air in the humid spots, and made us forget how dangerous for health are those gloomy and marshy forests.

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* Pedro de Cieça de Leon, a native of Seville, who travelled in 1531, at the age of thirteen years, in the countries that I have described, asserts that "*las tierras comarcanas del Rio Cenù y del Golfo de Uraba stan llenas de unos palmares muy grandes y espessos, que son unos arboles gruessos y llevan unas ramas como palma de datiles.*" See La Chronica del Peru nuevamenta escrita (Anvers, 1554), p. 21 and 204.

† I have carefully counted how many flowers are contained in a square inch on each *amentum,* from 100 to 120 of which are found united in one spathe.

After an hour's walk, we found, in a cleared spot, several inhabitants employed in collecting the wine of the Palm-tree. The dark tint of the *Zambos* contrasted singularly with that of a little man with light hair and a pale face, who seemed to take no part in the labour. I thought at first that he was a sailor escaped from some North American vessel; but I was soon undeceived. This fair complexioned man was my countryman, born on the coast of the Baltic: he had served in the Danish marine, and had lived for several years in the upper part of the Rio Sinu, near Santa Cruz de Lorica. He had come, to use the words of the loungers of the country (*para ver tierras y pasear, no* *mas*), " to see other lands, and walk about a little." The sight of a man who could talk to him of his country, seemed to have no charm for him; and, as he had almost forgotten German, without being able to explain himself clearly in Spanish, our conversation was not very animated. During the five years of my voyage in Spanish America, I found only two occasions of speaking my native language. The first Prussian I met with was a sailor from Memel, who served on board a ship from Halifax *, and who refused to make himself known till after he had fired some musket-shot at our boat. The second, the man of Rio Sinu, had very pacific intentions. Without answering my questions, he continued repeating, with a smile, " that the country was hot and humid; that the houses in the towns of Pomerania, were finer than those of Santa Cruz de Lorica, and that, if we remained in the forest, we should have the *calenturas*, the tertian fever, from which he had long suffered." We had some difficulty in testifying our gratitude to this good man for his benevolent advice; since according to the severity of his principles, somewhat aristocratical, a white man, were he bare-footed, should never accept money " in the presence of that vile yellow populace"

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* See above, vol. iii, p. 43.

(gente parda). Less disdainful than our European countrymen, we saluted politely the groupe of men of colour who were employed in drawing, by means of the great *tutumas*, or fruits of Crescentia Cujete, the *palm-tree wine* from the trunks of hewn down trees. We begged them to explain to us this operation, which we had already seen practised in the missions of the Cataracts. The vine of the country is the Palma dulce, the *Cocos butyracea*, which, near Malgar, in the valley of Magdalena, is called *wine palm-tree*, and here, on account of its majestic height, *royal palm-tree*. After having thrown down the trunk, which diminishes but little towards the top, they dig, below where the leaves *(frondes)* and spathes come out, an excavation in the ligneous part, eighteen inches long, eight broad, and six in depth. They work in the hollow of the tree, as if they would construct a canoe; and three days after this cavity is found filled with a yellowish-white juice, very limpid, with a sweet and vinous flavour. The fermentation appears to commence as soon as the trunk falls, but the vessels preserve their vitality; for we saw that the sap flowed even when the summit of the palm-tree (that part where the leaves come out) is placed a foot higher than the lower end, which is that of the roots. The sap continues to mount as in the arborescent Euphorbes re-

cently cut. During eighteen to twenty days, this *wine of the palm-tree* is daily collected; the last is less sweet, but more alcoholic and more esteemed. A tree yields as much as eighteen bottles of sap, each having a volume of forty-two cubic inches. The natives affirm that the flowing is more abundant, when the petioles of the leaves which remain fixed to the trunk, are burnt.

The great humidity and thickness of the forest forced us to retrace our steps, and regain the shore before sun-set. In several places, the compact limestone rock, perhaps of tertiary formation, appears. A thick layer of clay and mould rendered the observation difficult; but a shelf of carburated and shining slate, seemed to me to indicate the presence of more ancient formations. M. Pombo*, in a report made in the name of the chamber of commerce of Carthagena, positively affirms that there is real coal on the banks of the Sinu. We met with

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* *Informe del Real Consulado a la Suprema Junta provincial*, 1810, p. 45. In the manuscript memoir left, in 1789, by the archbishop-viceroy, Gongora, to his successor Fray Don Francisco Gil y Lemos, there is even a doubt concerning the sulphurated mercury found in small rounded pieces in the upper part of the Rio Sinù. These fragments were no doubt torn by the torrents from some veins of the Sierra de Abibe. I shall describe further on this *cinnabre de lavage* (in *pepitas*) peculiar to the heaped up earth of the Andes of Quindiù.

Zambos, carrying on their shoulders the cylinders of *palmito*, so improperly called *cabbage-palms*, three feet long, and five to six feet thick; the whitening gave them a dazzling tint. It appears that the stem of the palm-tree has been for ages an esteemed food in those countries: I believe it to be very innocent, although historians relate that, when Alonso Lopez de Ayala was governor of Uraba, several Spaniards died after "having eaten immoderately of the *palmito*, and drunk at the same time a great quantity of water." In comparing the herbaceous and nourishing fibres of the young leaves not developed of the palm-trees, with the *sagou* of *Mauritia*, of which the Indians make bread, similar to that of the root of Jatropha Manihot, we involuntarily recollect the striking analogy which modern chemistry has found between the ligneous matter and the amilaceous fécula. We stopped on the shore to collect lichens, opegraphas, and a great number of mosses (Boletus, Hydnum, Helvela, Thelephora) that were attached to Palétuviers, and there, to my great surprise, vegetated, although moistened by salt water. Night surprised us, and having unfortunately broken an oar in returning on board, in our little canoe, we had some difficulty in embarking on a rough sea.

Before I quit this coast, so seldom visited by travellers, and described in no modern voyage, I shall here state some information which I acquired during my stay at Carthagena. The Rio Sinu, in its upper course, approaches the tributary streams of the Atrato, which is of the same importance to the auriferous and planitiferous province of Choco, as the Magdalena for Cundinamarca, or the Rio Cauca for the provinces of Antioquia and Popayan. The three great rivers I have just mentioned form hitherto the only commercial route, I might almost add the only means of communication for the inhabitants. The Rio Atrato receives, at twelve leagues distance from its mouth, the Rio Sucio, on the east: the Indian village of San Antonio is situated on its banks. In going up beyond the Rio Pabarando *, you arrive in the valley of Sinu. After several fruitless attempts dictated by the warlike spirit of the Archbishop Gongora, to establish colonies in Darien del Norte and on the eastern coast of the gulf of Uraba, the Viceroy Espeleta counselled the court to fix its whole attention on the Rio Sinu, to destroy the colony of Cayman, to fix the planters in the Spanish village of San Bernardo del Viento, in the jurisdiction of Lorica,

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* Tributary stream of the Rio Sucio. See *Pombo, Informe*, p. 101, and manuscript map of the Atrato, traced, in 1780, by Don Juan Donoso, captain of the corps of engineers of S. C. M.

and from that post, which is the most westerly, to push forward the peaceful conquests of agriculture and civilization towards the banks of Pabarando, the Rio Sucio, and the Atrato*.

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* *Relacion del govierno del Excellentissimo Señor Don Jose de Espeleta en el Nuevo Reyno de Granada para entregar el mando al Excellentissimo Señor Don Pedro de Mendinuetta, en* 1796 (manuscript), cap. v, fol. 83. I shall here state some information which I drew from several official documents during my stay at Carthagena, and which have not yet been published. In the sixteenth and seventeenth century, the name of Darien was given vaguely to the whole coast extending from the Rio Damaquiel to the Punta de San Blas, on 2¼° of longitude. The cruelties exercised by Pedrarias Davila rendered almost inaccessible to the Spaniards a country which was one of the first they had *colonized.* The Indians (Dariens and Cunas-Cunas) remained masters of the coast, as they still are at Poyais, in the land of the Mosquitos. Some Scotchmen formed, in 1698, the settlements of *New Caledonia, New Edinburgh,* and *Scotch Port,* in the most eastern part of the isthmus, a little west of Punta Carreto. They were soon driven away by the Spaniards; but, as the latter occupied no part of the coast, the Indians continued their attacks against Choco's boats, which from time to time descended the Rio Atrato. The sanguinary expedition of Don Manuel de Aldarete, in 1729, served only to augment the resentment of the natives. A settlement for the cultivation of the cocoa-tree, attempted in the territory of Urabia, in 1740, by some French planters, under the protection of the Spanish government, had no durable success; and the court, excited by the reports of the vain and bustling archbishop-viceroy, Gongora, ordered, by the cedule of the 15th August, 1783, "either the conver-

The number of independent Indians who inhabit the lands between Uraba, Rio Atrato, Rio Sucio, and Rio Sinu, was, according to an enumeration (*padron*) made, in 1760, at least 1800, distributed in three small villages (Suraba, Toanequi, and Jaraguai). This popula-

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sion and conquest, or the destruction (*reduccion ò extincion*) of the Indians of Darien." This order, worthy of another age, was executed by the maréchal-de-camp Don Antonio de Arebalo; he found little resistance, and formed, in 1785, the four settlements and forts of Cayman on the eastern coast of the gulf of Urabia, the Concepcion, Carolina, and Mandinga. The *Lele* or high-priest of Mandinga took an oath of fidelity to the king of Spain; but, in 1786, the war with the Darien Indians recommenced, and finished by a treaty concluded July 27th, 1787, between the archbishop-viceroy and the cacique Bernardo. The forts and new colonies, which figured only on the maps sent to Madrid, augmented the debt of the treasury of Santa-Fe de Bogota, in 1789, to the sum of 1,200,000 piasters. The viceroy, Gil Lemos, wiser than his predecessor, obtained permission from the court (*Real Orden de 2 Abril* 1789) to abandon Carolina, the Concepcion, and Mandinga. The settlement of Cayman only was preserved, on account of the navigation of the Atrato, declared free under the government of the archbishop-viceroy: it was proposed to transfer this settlement to a more healthy spot, that of Uraba; but lieutenant-general Don Antonio Arebalo, having proved that the expence of this removal would amount to the sum of 40,000 piasters, the fort of Cayman was also destroyed, by order of the viceroy Espeleta, in 1791, and the planters were compelled to join themselves to those of the village of San Bernardo.

tion was computed at the period of my voyage, to be 3000. The natives, comprehended in the general name of *Caymans,* live in peace with the inhabitants of San Bernardo del Viento (*pueblo de Españoles*), placed on the western bank of the Rio Sinu, lower than San Nicolas de Zispata, and near the mouth of the river. These inhabitants have not the ferocity of the Darien and Cunas Indians on the left bank of the Atrato; who often attack the boats which trade with the town of Quibdo in the Choco; they also make incursions on the territory of Uraba, in the months of June and November, to collect the fruit of the cacao-trees, which are the remains of some ancient plantations of French settlers. The quality of the cacao of Uraba is excellent, and the Darien Indians sometimes come to sell it with other productions to the inhabitants of Rio Sinu, entering the valley of that river by one of its tributary streams, the Jaraguai.

It cannot be doubted that the gulf of Darien was considered, at the beginning of the sixteenth century, as a nook in the country of the Caribs. The word *Caribana* is still preserved in the name of the eastern cape of that nook. We know nothing of the languages of the Darien, Cunas, and Cayman Indians; and we are altogether ignorant if Carib or Arouac words are found in their idioms; but it is certain, notwithstanding the testimony of Anghiera [*], on the identity of the race of the Caribs of the Little Antilles and the Indians of Uraba, that Pedro de Cieça, who lived so long among the latter, never calls them *Caribs* nor *Cannibals.* He describes the race of that tribe, as being naked, with long hair, and going to the neighbouring countries to trade; the women as being cleanly, well dressed, and extremely engaging (*amorosas y galanas*). "I have not seen, adds the *Conquistador*, any more beautiful [†] in all the Indian lands I have visited;

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[*] *See* above, vol. vi, p. 24 and 39, note ‡.

[†] *Cronica del Peru,* p. 21 and 22. The Indians of Darien, Uraba, Zenu (Sinù), Tatabé, the valleys of Nore and of Guaca, the mountains of Abibe and Antioquia, are accused, by the same author, of the most ferocious anthropophagy; and perhaps that circumstance alone gives rise to the idea that they were of the same race as the Caribs of the West Indies. In the celebrated *Provision real* of the 30th of October, 1503, by which the Spaniards are permitted to make slaves of the anthropophagitic Indians of the archipelago of San Bernardo, opposite the mouth of the Rio Sinù, the Isla Fuerte, Isla Bura (Barù), and Carthagena (*gente que se dice Canibales*), there is more of a question of morals than of the race, and the denomination of *Caribs* is altogether avoided. Cieça asserts that the natives of the valley de Nore seized the women of neighbouring tribes, in order first to devour the children who were born of the union with foreign wives, and then the women themselves. Foreseeing that this horrible depravation of human nature would not be believed, although it had been observed by Colon in the West

they have one fault however, that of having too frequent conversations with the devil."

The Rio Sinu, by its position and its fertility, is of the highest importance for provisioning Carthagena. In time of war, the enemy usually placed their ships between the Morro de Tigua and the Boca de Matunilla, to interrupt the barks laden with provisions. In that station, they were however sometimes exposed to the attack of the gun-boats of

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Indies, he cites the testimony of Juan de Vadillo who had observed the same facts, and who was still living in 1554, when the *Chronica del Peru* appeared in Dutch. *See* on the manners of the Indians of the valley of de Nore, and the *travelling bed* of a great Indian lord, named Nabonuco, *l. c.*, p. 29 and 30. With respect to the etymology of the word *cannibal*, it seems to me entirely cleared up by the discovery of the journal kept by Colon during his first voyage of discovery, and of which Bartholomè de las Casas has left us an abridged copy. "Dice mas el Almirante que en las islas passadas estaban con gran temor de *carib* y en algunas los llamaban *caniba* pero en la Española *carib* y son gente arriscada, pues andan por todas estas islas y comen la gente que pueden haber." (*Navarrete*, tom. i, p. 135.) In this primitive form of words, it is easy to perceive that the permutation of the letters *r* and *n*, an effect of the imperfection of the organs in some nations, might change *carib* into *canib*, or *caniba*. Geraldini, who, according to the tendency of that age, sought, like Cardinal Bembo, to latinize all the barbarous denominations, recognizes, in the Cannibals, the manners of *dogs*, nearly as Saint Louis desired to send the *Tatares* or Tartares, " ad suas *tartareas* sedes unde exierint."

Carthagena, which can pass by the channel of Pasacaballos, that separates, near Saint Anne, the isle of Baru from the continent. Lorica has remained, since the sixteenth century, the principal town of Rio Sinu; but its population, which, in 1778, under the government of Don Juan Diaz Pimienta, amounted to 4000 souls, has considerably diminished, because nothing has been done to secure the town from inundations and the deleterious miasmata they produce.

The gold washings of the Rio Sinu, heretofore so important, above all, between its source and the village of San Geronimo, have almost entirely ceased, as well as those of Cienega de Tolu, Uraba, and all the rivers descending from the mountains of Abibé *. "The Darien and the Zenu, (says the bachelor Enciso, in his *Work on Geography*, published at the beginning of the sixteenth century,) is a country so rich in gold pepites, that, in the running waters, that metal can be fished with nets." Excited by these narratives, the governor Pedrarias sent his lieutenant Francisco Becerra, in 1515, to the Rio Sinu. This expedition had the most fatal consequences, for Becerra and his troop were massacred by the natives, of whom the Spaniards, according to the custom of the time, had carried away a great number as slaves to be sold in the West Indies. The province of Antioquia now furnishes, in its auriferous veins, a vast field for mining speculations; but it would no doubt be prudent to lay aside gold washings for the cultivation of colonial productions, in the fertile lands of Sinu, the Rio Damaquiel, the Uraba, and the *Darien del Norte,* above all, that of cacao, which is of a superior quality. The proximity of the port of Carthagena would also render the neglected cultivation of quinquina, of great importance to the trade with Europe. That precious tree vegetates at the source of the Rio Sinu, as in the mountains of Abibé and Maria. The real febrifuge quinquina, with a hairy corolla, is no where else found so near the coast, if we except the Sierra Nevada of Santa Marta. A memoir, written by the prior of the *Consulado* of Carthagena, Don Ignacio Pombo, contains the most useful views on the colonization of the Rio Sinu, on the establishment of a courier who would go by land from Lorica to Uraba, and from thence by water to Quibdo, after having left the correspondence of Antioquia at the mouth of the Bebara; finally, on the timber trade, which seems to be invited by the rivers descending from the Sierra de Abibe and the mountains of Choco, such as the Sinu, the Damaquiel, the Suriquilla, the Sucio, and the Atrato.

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* That chain of mountains forms one of the branches of the *knot of Antioquia.* It seems to terminate towards the north by the *Cerro del Aguila,* near the *Punta de Uraba.* The famous Captain Francisco Cesar crossed it first: Cieça there found a great number of *suspended bridges.* He distinguished the mountains of Abibé and the province of Dabaybe (Dobaybe), the *Dorado* of those countries. *See* above, vol. vi, p. 260 (note), 452, &c. *Cieça,* cap. x and xii, p. 26 and 29. *Herera, Dec. I, lib. 9, cap.* 6; *Dec. II, lib.* 2, *cap.* 4.

The Rio Sinu and the gulf of Darien were not visited by Columbus. The most eastern point where that great man touched land, on the 26th November, 1503, is the Puerto de Retreto, now called Puerto de Escribanos, near the Punta of San Blas, in the isthmus of Panama [*]. Two years before, Rodrigo de Bastidas and Alonso de Ojeda, accompanied by Amerigo Vespucci, had discovered the whole coast of the main land, from the gulf of Maracaybo [†] as far as the Puerto de Retreto. Having often had occasion in the preceding volumes to speak of *New Andalusia*, I shall here state the historical remark on the primitive sense of that denomination. I found it, for the first time, in the convention made by Alonso de Ojeda with the *Conquistador* Diego de Sicuessa, a powerful man [‡], say the historians of his time, "because he was a flattering courtier and a wit." In 1508, all the country from the cape de la Vela to the gulf of Uraba, where the *Castilla del Oro* begins, was called *New Andalusia*, a name since restricted to the province of Cumana.

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[*] *See* Cuarto Viage del Almiraute dans *Navarrete, Col. de los descubr. esp.*, tom. i, p. 285, 288.

[†] *Tenia fabor, por ser gran cortesano y de buenos dichos.*

[‡] This gulf was then called gulf de *Coquibocoa*, or Vene-

A fortunate chance led me to see, during the course of my voyage, the two extremities of the main land, the mountainous and verdant coast of Paria, where Columbus, in his poetical exaltation, placed the cradle of the human race *, and the low and humid coast which extends from the mouth of the Sinu towards the gulf of Darien. The comparison of these scenes, again become savage, confirms what I have elsewhere advanced, on the strange and sometimes retrograde state of civilization in America. On one side, the coast of Paria, the islands of Cubagua and la Marguerite; on the other, the gulf of Uraba and Darien, received the first Spanish planters. The gold and pearls which were there found in abundance, because from time immemorial they had been accumulated in the hands of the natives, gave those countries a popular celebrity, from the beginning of the sixteenth century. At Seville, Toledo, Pisa, Genoa, and Antwerp, the names of these coun-

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zuela. (*Herera, Dec. I, lib.* 4, *cap.* 11.) The former name is preserved in the neighbouring cape of *Chichibacoa*.

* *Navarrete,* tom. ii, p. 143, and *Meños Hist. del Nuevo Mundo,* tom. i, p. 217.

tries were pronounced like those of Ormuz and Calicut. The pontiffs of Rome consigned them in their bulls; and Bembo has recorded them in those admirable pages which have added to the glory of Venice, and survived its liberty. There is something seducing in the indistinctness of a happy beginning; the creative imagination of man gives grandeur to what is only sketched. This charm of indefinite hope, this pleasure of adding by the power of thought, to what in the real world is narrow and limited, is every where displayed in the germ of great discoveries, as in the unfinished productions of the pencil; in the first development of a noble character; and in the simplicity and confiding youth of nations who attempt to construct their social edifice.

At the close of the fifteenth and the beginning of the sixteenth century, Europe saw only, in the parts of the New World discovered by Columbus, Ojeda, Vespucci, and Rodrigo de Bastidas, the advanced capes of the vast land of India and eastern Asia, of which the immense wealth in gold, diamonds, pearls, and spices, had been vaunted in the narratives of Benjamin de Tudela, Rubriquis, Marco Polo, and Mandeville. Columbus, with an imagination filled with these narrations, caused an act to be prepared before a notary, on the 12th

June, 1494, in which sixty of his companions, pilots, sailors, and passengers, certified upon oath, that the southern coast of Cuba made a part of the continent of India. The description of the treasures of Catay and Cipango, of the *celestial town* of Quinsay and the province of Mango, which had inflamed his desires in early life, pursued him like phantoms in his declining days. In his fourth and last voyage, on approaching the coast of Cariay (Poyais, or *Musquito Coast*), Veragua, and the Isthmus, he believed he was near the mouth of the Ganges *. These geographical illusions, this mysterious veil, which enveloped the first discoveries, contributed to enlarge every object, and to fix the attention of Europe on regions of which the names are to us scarcely known. New Cadiz, the principal seat of the pearl-fishery, was placed in an island which is again become uninhabited. The extremity of the rocky coast of Paria is alike desert. Several towns were founded at the mouth of the Rio Atrato, by the names of *Antigua del Darien*, *Uraba*, or *San Sebastian de Buenavista.* In these spots, so celebrated at the beginning of the sixteenth century, the historians of the conquest tell us, that *the flower of the Castillian heroes* were found assembled: thence Balboa set out to discover the South Sea; Pizarro, when he conquered and ravaged Peru; Pedro de Cieça, who, in combatting, constantly followed the chain of the Andes, by Antioquia, Popayan, and Couzco, as far as la Plata, after having gone 900 leagues by land. These towns of Darien are destroyed; some ruins scattered on the hills of Uraba, the fruit-trees of Europe mixed with native trees, mark to the traveller the spots which those towns once occupied. In almost all Spanish America, the first lands peopled by the *Conquistadores*, have fallen back into barbarism *. Other countries, discovered later, draw the attention of the colonists: such is the natural progress of things in peopling a

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* "Tambien dicen que lar mar Baxa a Ciguare y de allì a diez jornadas es el *Rio de Guangues:* parce que estās tierras estan con Veragua como Tortosa con Fuenterabia ò Pisa con Venecia." These words are taken from the *Lettera rarissima* of Colon, which I have mentioned above (vol. vii, p. 314), and of which the original Spanish was lately found, and published by the learned M. Navarrete, in his *Coleccion de Viages*, vol. i, p. 299.

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* In carefully collating the testimonies of the historians of the *Conquest*, some contradictions are observed in the periods assigned to the foundation of the towns of Darien. Pedro de Cieça, who had been on the spot, affirms, that under the government of Alonso de Ojada and Nicuessa, the town of *Nuestra Señora Santa Maria el Antigua del Darien* was founded on the western coast of the gulf or *Culata de Uraba*, in 1509; and that later (*despues desto passado*) Ojeda passed to the eastern coast of the *Culuta* to construct the town of *San Sebastian de Uraba.* The former, called by abbreviation

Ciudad del Antigua, had soon a population of 2000 Spaniards, while the latter, the *Ciudad de Uraba*, remained desert, because Francisco Pizarro, since known as the conqueror of Peru, was forced to abandon it, having vainly demanded succours from Saint Domingo. (*Chronica del Peru, cap.* 6.) The historian Herera, after having said in the 15th chapter of his *Geographic Description of the West Indies*, that the foundation of *Antigua* had preceded one year that of *Uraba* or *San Sebastian*, affirms the contrary in the following chapter, and in the Chronicle itself. (*Dec. I, lib.* iv, *cap.* 11; *lib.* vii, *cap.* 16; *lib.* viii, *cap.* 11; *lib.* x, *cap.* 17; *Dec. II, lib.* ii, *cap.* 1; *Dec. V, lib.* ii, *cap.* 4. *Descript. gèog., éd.* 1601, p. 41 and 45.) It was, according to the Chronicle, in 1501, that Ojeda, accompanied by Vespucci, and penetrating for the first time the gulf of Uraba or Darien, " resolved to construct with wood and unbaked bricks, a fort at the entrance of Culata." It appears, however, that this enterprize was not executed; for, in 1508, in the convention made by Ojeda and Nicuessa, they each promised to build two fortresses on the limits of *New Andalusia* and of *Castilla del Oro*. Herera, in the 7th and 8th books of the first *Décade*, places the foundation of *San Sebastian de Uraba*, at the beginning of 1510, and as being the most ancient town of the continent of America, after that of *Ceragua*, founded by Columbus, in 1503, on the Rio Belen. He relates how Francisco Pizarro abandoned that town, and how the foundation of the *Ciudad del Antigua* by Entiso, towards the end of the year 1510, was the consequence of that event. (Leo X, erected *Antigua* into a bishoprick, in 1514; and this was the first episcopal church of the continent. In 1519, Pedrarias Davila persuaded the court of Madrid, by false reports, that the seat of the new town of Panama was more vast continent. It may be hoped that on several points the people will return towards the places that were first chosen. It is difficult to conceive why the mouth of a great river, descending from a country rich in gold and platina, has remained uninhabited. The Atrato, heretofore called Rio del Darien, de San Juan, or Dabayba, has had the same fate as the Oroonoko. The Indians who wander around the Delta of those rivers have remained in a savage state. It is useless to invoke the great shades of Christopher Columbus and of Vespucci, one of whom ascertained in 1498 the channel of Pedernales, one of the mouths of the Oroonoko, and the other, in 1501, the gulf of Uraba. The dates alone suffice to depose against the indifference of the mother country, and the spirit of the ages which have followed the period of the great discoveries.

We weighed anchor in the road of Zapote, the 27th March, at sun-rise. The sea was less stormy and rather warmer, although the fury of

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healthful than that of *Antigua;* the inhabitants were compelled to abandon the latter town, and the bishoprick was transferred to Panama. The gulf of Uraba remained desert during thirteen years, till the founder of the town of Carthagena, Pedro de Heredia, after having dug up the graves, or *huacas* of the Rio Sinù, to collect gold, sent his brother Alonso, in 1532, to repeople *Uraba,* and reconstruct on that spot, a town by the name of *San Sebastian de Buenavista.*)

the wind was the same. We saw to the north, a succession of small cones of an extraordinary form, as far as the *Morro de Tigua ;* they are known by the name of *Tetas* de Santero, de Tolu, de Rincon, and de Chichimar. The two latter are nearest the coast. Some angles of height of the *Tetas de Tolu* scarcely gave them 240 toises: they rise in the middle of the savannahs, where, on the trunks of the Toluifera balsamum, the precious balm of Tolu is collected, heretofore so celebrated in the pharmacies of Europe, and of which there is a little trade carried on at Corozal, Caimito, and the town of Tacasuan. In the savanas *altas del Tolu,* oxen and mules wander half-wild. Several of those hills, between Cienega de Pesquero and the Punta del Comissario, are linked two and two together, like basaltic cones ; it is, however, very probable that they are calcareous, like the *Tetas de Managua,* south of the Havannah. We passed in the Archipelago of San Bernardo, between the island of Salamanquilla and the Cape Boqueron. We had scarcely quitted the gulph of Morosquillo, when the sea became so rough that our little vessel of twenty tons was almost constantly below water. It was a fine moonlight, and our captain sought in vain a shelter on the coast, on the north of the village of Rincon. We cast anchor at four fathoms; but having discovered that we were upon a rock of coral, we preferred the open sea.

The coast has a singular configuration from the Morro de Tigua, where the groupe of little mountains cease which rise insularly from the plain. We found at first a marshy soil, of eight leagues square, between the *Bocas de Matuna* and *Matunilla.* These marshes are connected by the *Cienaga de la Cruz*, with the *Dique* of *Mahates* and the Rio Magdalena. The *Isle* of *Baru*, which, with the isle of *Tierra Bomba*, forms the vast port of Carthagena, is, properly speaking, but a peninsula fourteen miles long, separated from the continent by the narrow channel of *Pasacaballos.* As a groupe of islands, the Archipelago of San Bernardo is placed opposite Cape Boqueron. Another Archipelago, that of Rosario, accompanies also the southern extremity of the peninsula of Baru. These rents in the coast are repeated at the 10¼° and 11° of latitude. The Peninsulas near the *Ensenada* of *Galera de Zamba* and near the port of *Savanilla*, display the same aspect as the Peninsula Baru. The same causes have produced similar effects; and the geognost ought not to neglect those analogies, in the configuration of a coast which, from Punta Caribana in the mouth of the Atrato, beyond the Cape of la Vela, on one hundred and twenty leagues of length, has a general direction from S.W. to N.E.

The wind became calm during the night: we could only advance near the isle of Arenas, where we anchored. I found it was 78° 2′ 10″ of longitude *, supposing Carthagena to be 77° 50′ 10″. When I arrived at Carthagena, I compared this chronometric result with that obtained by Mr. Fidalgo. That able navigator placed the island of Arenas 10′ 35″ west of the meridian of the cathedral of Carthagena. The weather became stormy during the night. We again set sail, on the 29th of March, in the morning, hoping to be able to enter that day at *Boca Chica*. The gale blew with extreme violence, and we were unable to proceed with our frail bark against the wind and the current. I have seldom seen a higher sea. The surges broke in foam upon the deck. We were running short tacks, when, by a false manœuvre in setting the sails, (we had but four sailors,) perhaps also through the fault of the boatswain, we were during some minutes in imminent danger. The captain, who was not a very bold mariner, would no longer ascend up the coast, and we took refuge, under the wind, in a nook of the isle of Baru, south of the *Punta Gigantes*. It was Palm Sunday; and the Zambo, who had followed us to the Oroonoko, and did not leave us till we returned to France, did not fail to remind us that on the same Sunday the preceding year, we had nearly been lost, on the north of the mission of Uruana *.

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* *Obs. Astr.*, vol. ii, p. 142.

There was to be an eclipse of the moon during the night, and the next day an occultation of α of the Virgin. The observation of the latter phenomenon might have been very important as to the longitude of Carthagena. I insisted in vain with my captain to give me one of his sailors, to accompany me by land to the foot of *Boca Chica.* The distance is five miles, and he objected the savage state of the spot, in which there is neither habitation nor path. A little incident, which might have rendered Palm-Sunday more *fatal,* justified the prudence of the captain. We went, by a fine moon-light, to collect plants on the shore; as we approached the land, we saw a young negro issue from the brush-wood, quite naked, loaded with chains, and armed with a cutlass. He engaged us to disembark on a beach covered with large paletuviers, as being a spot where the sea did not break in; he offered to conduct us to the interior of the island of Baru, if we would promise to give him some clothes. His cunning and savage air, the often-repeated question whether we were Spaniards, the unintelligible words addressed to companions who remained concealed behind the trees, inspired us with some mistrust. These blacks were no doubt *maroon* negroes, slaves escaped from the prison where they were held in irons. This unfortunate class are the most to be dreaded; they have the courage of despair, and a desire of vengeance, nourished by the rigor of the whites. We were without arms; they appeared to be more numerous than we were, and perhaps engaged us to disembark, to take possession of our canoe. We thought it most prudent to return on board our vessel. The aspect of a naked man, wandering on an uninhabited beach, without being able to unrivet the chains fastened round his neck and the upper part of his arm, left us the most painful impressions. They could only have been augmented by the ferocious regrets of our mariners, who wanted to return to the shore and seize the fugitives, to sell them secretly at Carthagena. In climates where slavery exists, the mind is familiarized with suffering, and that instinct of pity is stiffled which characterizes and enobles our nature.

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* *See* above, vol. iv, p. 495.

At anchor, near the isle of Baru, in the meridian of Punta Gigantes, I observed the eclipse of the moon of the 29th of March, 1801. The total immersion took place at $11^h\ 30'\ 12{\cdot}6''$ mean time. Some groupes of vapors, scattered over the azured vault of the sky, rendered the observation of the immersion uncertain. I measured the progress of the eclipse with the sextant, a method which cannot be too much recommended to mariners, because it may be employed on a stormy sea, and multiplies the means of observation. In order to draw advantage from a phenomenon generally regarded as of little importance in the determination of the longitude, we must be able to count on the fortuitous compensation of errors. M. Oltmanns * has discussed this observation, and deduces the longitude at $5^h\ 11'\ 22''$. The chronometer gave me $14{\cdot}7''$ in time, for the difference of the meridians of Punta Gigantes and Carthagena. During the total eclipse, the lunar disk displayed, as almost always happens, a reddish tint, without disappearing; the edges, examined with a sextant, were strongly undulating, notwithstanding the considerable height of the orb. It appeared to me that the moon remained more luminous than I had ever seen it in the temperate zone. The vividness of the light, it may be conceived, does not depend solely on the state of the atmosphere, which reflects, more or less feebly, the solar rays, by inflecting them in the cone of the shade, but it is also modified by the variable transparency of that part of the atmosphere across which we perceived the moon eclipsed. Within the tro-

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* *Obs. Astr.*, vol. ii, p. 145.

pics, a great serenity of the sky, a perfect dissolution of the vapors, diminish the extinction of the light which the lunar disk sends us back. I was singularly struck, during the eclipse, by the want of uniformity in the distribution of the refracted light by the terrestrial atmosphere. The central region of the disk displayed a shadow, like a round cloud, of which the movement was from east to west. The part where the emersion was to take place was consequently, a few minutes before the emersion, much more illuminated than the western edges. Must we attribute this phenomenon to an unequal part of our atmosphere, to a partial accumulation of vapors which, in absorbing a considerable part of the solar light, inflects less on one side the cone of the shadow of the earth? If a similar cause, in the perigee central eclipses, sometimes renders the disk invisible, may it not happen also that only a small portion of the moon is seen, a disk irregularly formed, and of which different parts were successively enlightened?

The morning of the 30th March, we doubled the Punta Gigantes, and made sail towards the *Boca Chica*, the present entrance of the port of Carthagena. From thence there are seven or eight miles to the anchorage near the town; and although we took a *practico* to pilot us, we repeatedly touched the sand-banks. On disembarking, I learnt with great satisfaction, that the expedition appointed to take the survey of the coast, commanded by M. Fidalgo, had not yet put to sea. This circumstance not only gave me the facility of assuring myself of the astronomical position of several towns on the shore, which had served me as points of departure in fixing chronometrically the longitude of the *Llanos* and the Oroonoko; but also contributed to instruct me with respect to the future direction of my journey to Peru. The passage from Carthagena to Portobello, and that of the isthmus by the Rio Chagre and Cruces, are alike short and easy; but it was to be feared, that in sojourning a long time at Panama before we found an opportunity of going to Guayaquil, the navigation of the South Sea would be extremely long, in a direction contrary to the winds and currents. I relinquished with regret the hope of levelling, with the aid of the barometer, the mountains of the isthmus, although it would then have been difficult to foresee that at the moment when I write these lines in 1827, while measurements have been accumulated on so many other points of Mexico and Columbia, we should remain in the same ignorance of the height of the ridge which divides the waters in the isthmus. The persons we consulted all agreed that the journey by land, along the Cordilleras, by Santa Fe de Bogota, Popayan, Quito, and Caxamarca, would be preferable to the sea-voyage, and furnish an immense field for exploration. The predilection of the Europeans for the *tierras frias*, for the cold and temperate climate that prevails on the back of the Andes, gave further weight to these counsels. The distances were known, but we were deceived with respect to the time it would take to pass over them on the back of mules. We did not imagine that, in a road of six hundred leagues, of which every step was interesting for geography and botany, it would require more than eighteen months to go from Carthagena to Lima. Notwithstanding this delay, or rather on account of the slowness with which we passed through Cundinamarca, the provinces of Popayan and Quito, I had no regret at having sacrificed the passage of the Isthmus to the journey of Bogota. This change of direction gave me occasion to trace the map of the Rio Magdalena, to determine astronomically the position of eighty points, situated in the inlands, between Carthagena, Popayan, and the upper course of the river of the Amazons and Lima, to discover the error in the longitude of Quito, to collect several thousand new plants, and to observe on a vast scale the relations between the rocks of syenitic porphyry and trachyte with the fire of volcanoes.

The result of those labors, of which it is not for me to appreciate the importance, have long since been published. My map of Rio Magdalena, multiplied by the copies of the year 1802 in America and Spain, and comprehending the country between Almaguer and Santa Marta, from 1° 54′ to 11° 15′ of latitude, appeared in 1816. Till that period, no traveller had undertaken to describe New Grenada; and the public, except in Spain, knew the navigation of the Magdalena only by some lines traced by Bouguer: that learned traveller had descended the river from Honda; but, being in want of astronomical instruments, he had fixed but four or five latitudes, by means of small dials hastily constructed. The narratives of voyages in America are now singularly multipled. Political events have led a great number of persons to those countries which have given themselves free institutions; and those travellers have perhaps too hastily published their journals on returning to Europe. They have described the towns where they resided, and the aspect of some scenes remarkable for the beauty of the landscape: they have made known the clothing and nourishment of the inhabitants, and the different modes of travelling, in barks, on mules, or on men's backs. These works, several of which are agreeable and instructive, have familiarized the nations of the Old World with those of Spanish America, from Buenos Ayres and Chili as far as Zacatecas and New Mexico.

It is however to be regretted, that the want of a thorough knowledge of the Spanish language, and the little care taken to acquire the names of places, rivers, and tribes, have occasioned the most singular mistakes: and it is also afflicting (and the inhabitants of South America have above all to complain) that, in language without taste or dignity, the manners of the natives are described in the most unjust and disdainful terms. Treating with levity what is most serious in human nature, desiring to characterize nations like individuals, some of those narratives have renewed in our days, those enumerations of vice and virtue which disfigured the ancient treatises of geography, and which are founded on vague popular belief. Those writers have forgotten that great human societies, in all that is generous or perverse in their dispositions, display a family air, and are only distinguished from each other by slight shades of difference, by the preponderance of some intellectual faculties, by some propensities of the soul, of which the deviation constitutes what we call the defects of national character.

In the tardy publication of my *Personal Narrative,* which has been preceded by works of science of a circumscribed interest, I have been anticipated by travellers who have passed through America twenty-five years after me. I venture however to flatter myself, that whatever is most essential in the following pages, is at present as new, as if had been made known immediately after my return to Europe. Such an assertion may appear presumptuous and daring to those who imagine that a region is known whenever it has been passed over in every direction by armies, or visited by a great number of Europeans drawn thither by commercial speculations; but it will appear irreproachable and natural to those who will place themselves in the position which the author of this work has chosen. Since the middle of the eighteenth century, since the observations simply astronomical of La Condamine, Bouguer, Don George Juan, and Ulloa, to the period of my voyage, no page was published in Europe * that treated, even in the most imperfect manner, of the configuration of the surface, the extent and height of the table-lands, the modifications of climate, or mean temperature, the aspect and distribution of plants, the geognostic constitution of the soil, and the variations of the dip and magnetic forces. The war of independence has

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* An instructive journal, published by Mr. Caldas, at Santa Fe de Bogota, in 1807 and 1808, with the title of *Semanario*, made known not only the translation of my physical table of the equinoxial regions, but many observations of meteorology, and several measures of height made with the aid of the barometer in the provinces of Popayan and of Antioquia.

opened those fine regions of the globe to the industry and trade of Europe; but the books which have since appeared on the Columbian republic and Peru, are composed by persons whose occupations, and perhaps also whose knowledge, did not admit of their throwing light on the physical geography of the countries which they visited. I have suppressed, in transcribing my journal, all that has been already said of the aspect and construction of towns, the clothing of different castes, the details of ordinary life, and the means of transport. Above all, I have abstained from the polemics which render the perusal of travels so fatiguing. Ardently desirous of avoiding error, I have not occupied myself with the opinions of those who have written on the same subject. I wished to preserve for the narrative of my travels, its independence on passing circumstances, and its peculiar character, that of a work of science. In order to attain this end, I have directed my efforts to retrace to the imagination the physical representation of the Cordilleras * and the

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* Since the month of November, 1822, three travellers, whose labors I have often mentioned with praise, MM. Boussingault, Roulin, and Rivero, have begun to throw new light on the parts of Columbia which I could not visit; for instance, on the road of Nueva Valencia, by Merida and Pamplona, at Bogota, on the banks of the Meta, and on the province of Antioquia. I owe particularly to the friendship

plains, the force of an agitated and powerful nature, which fertilizes and destroys alternately, the eternal influence exerted by the configuration of the earth, the course of the rivers that furrow it, the vegetable layer that covers it in the social state, and finally, the institutions and the destinies of nations.

During the six days of our stay at Carthagena, our most interesting excursions were directed towards the *Boca Grande* and the hill of *Popa*, which commands the town and a very extensive view. The port, or rather the *bahia*, is nearly nine miles and a half long, if we compute the length from the town (near the suburb of *Jehemani* or *Xexemani*) to the *Cienega* of Cacao. The *Cienega* is one of the nooks of the isle of Baru, south-west of the *Estero de Pasacaballos*, by which we reach the opening of the *Dique de Mahates*. Two extremities of the small isle of *Tierra Bomba* form, on the north, with a neck of land of the continent, and on the south, with a cape of the isle of *Barù*, the only entrances to the bay of Carthagena; the former is called *Boca Grande*, the second *Boca Chica*. This extraordinary conformation of the land has given rise, during a century, to theories

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of M. Boussingault, manuscript notes, which were published in the *Annales de Chimie et de Physique*, and which prove the variety and extent of his knowledge.

entirely contradictory respecting the defence of a place, which, after the Havannah and Portocabello, is the most important of the main land and the West Indies. The engineers differed relatively to the choice of the opening which should be closed; and it was not, as several writers have repeated, after the disembarkment of Admiral Vernon, in 1741, that the idea was first conceived[*] of filling up the *Boca Grande*. The English forced the small entrance, when they rendered themselves masters of the bay; but being unable to take the town of Carthagena, which made a brave resistance, they destroyed the *Castillo Grande*, called also *Santa Cruz*, and the two forts of *San Luis* and *San Jose*, which defended the *Boca Chica*. These events made a strong impression in regions where the inhabitants were accustomed to uninterrupted peace. The negligence with which the service of the place of Carthagena was made, in 1735, was so great[†] that "the centinels remained in their posts, without being relieved, during two or three months; they slept there as at a country-house, and went during the day to work in the town."

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[*] *La entrada antigua era por un angosto canal que llaman Boca Chica*, says Don Jorge Juan, in his *Secret Notices*, addressed to the Marquis de la Ensenada; *de resultas de esta invasion se acordò dejar cioga y impassable la Boca Chica y volver a abrir la antigua fortificandola.* (*Secr. Not.*, vol. i, p. 4.)

[†] *L.* c., p. 131.

The ill-founded apprehension which the proximity of the *Boca Grande* to the town, excited in some of the engineers, determined the court of Madrid, after the English expedition, to shut up the entrance on a distance of 2640 varas *. From two and a half to three fathoms of water were found, and a wall, or rather a dyke, in stone, from fifteen to twenty feet high, was raised on piles. The slope on the side of the water is unequal, and seldom 45°. It is an immense work, terminated under the Viceroy Espeleta, in 1795, and has cost the lives of many hundred Galerians. The expence, according to the accounts found in the *Contaduria*, amounts to half a million of piasters, taken on the funds allotted for the fortifications of the *Boca Chica* and the *Castillo de San Lazaro*. These fortifications were executed since 1786, from plans traced by the brigadier Don Augustin Cramer; but the filling up of the *Boca Grande* ought not to be attributed to that able engineer. The work was begun before he visited † Carthagena and Portobello, and it is known by tradition that he was as hostile to that enterprize as Don Jorge Juan. Art could not vanquish nature; the sea tends, by alluvions, to close the *Boca Chica*, while it labors unceasingly to open and enlarge the *Boca Grande*. The currents, that during a great part of the year, above all when the *vendavales* blow with violence, ascend from S.W. to N.E., throwing sands into the *Boca Chica*, and further on, even into the bay itself. The passage, which is from seventeen to eighteen fathoms deep, becomes more and more narrow *, and if a regular cleansing be not established by dredging-machines, vessels will not be able to enter without running the risk of striking several times. It is this small entrance which should have been closed; its opening is only 260 toises, and the passage or navigable channel is 110 toises. The flat of Salmedina renders it dangerous for boats coming from the N.W., and its distance from the port or anchorage near the town (a distance of seven miles) would oblige ships of war to go out very slowly in case of an aggression on the side of the

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* More than 1100 toises, of which only 720 toises were walled.

† *Relacion del Govierno del Excellentissimo Señor Don Josef de Espeleta,* 1796, part iv, cap. 8, fol. 119 (manuscript).

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* At the foot of the two forts (San Jose and San Fernando), constructed for the defence of the Boca Chica, it may be seen how much the land has gained upon the sea. Necks of land are formed on both sides, and also before the Castillo del Angel, which towards the north commands the fort of San Fernando.

Ocean. The current, which at the *Boca Grande* descends from the promontory of *Galera Zamba,* works continually at the destruction of what art has formed; and the smugglers and fishermen have seconded the efforts of the waves. The dyke has been torn up towards the south on a length of more than twenty feet. This breach was nine feet deep in 1800, and after a warm contest among the authorities, on the possibility of the attack of an enemy by the *Boca Grande,* the commander of the port of Carthagena, Don Joaquin Fidalgo, caused all the *lanchas cañoneras* to go out across the broken dyke. The depth has since been diminished to three or four feet, but the reparations are of short duration. If the resolution be one day taken to abandon the *Boca Chica,* and re-establish the *Boca Grande* in the state which nature seems to prescribe, new fortifications must be constructed on the S.S.W. of the town. This fortress has always required great pecuniary sacrifices to keep it up; and, under the old Spanish dominion, became often the cause of the most cruel financial embarrassments. The construction of the fortifications, the filling up the *Boca Grande,* and the armaments of the viceroy Don Manuel Antonio Flores *, gave occasion to the introduction of the tax on tobacco, and to the vexations of a *Regente Visitador,* which excited the people to revolt, in 1781, first at Sicerro, and then at Zipaquira, almost at the gates of the capital of Bogota. Under the administration of the viceroy Don Pedro de Mendinueta, who has left a reputation of the most honorable disinterestedness, the annual expences of fortification, artillery, and marine, amounted at Carthagena, to 980,000 piasters, and for the isthmus of Panama, to 400,000.

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* The debt of the treasury at the end of the administration of the viceroy Flores, was 889,400 piasters.

If the republic of Columbia does not considerably simplify the system of defence of its shore, which is 660 marine leagues in extent*, she will have to chuse whether she will suffer the numerous fortifications of Cumana, Morro de Barcelona, La Guayra, Portocabello, Castillo de San Carlos, at the mouth of the lake Maracaybo, Toreon de San Jorge de Rio Hacha, Morro de Santa Marta, Carthagena, Portobello, Fuerte de San Lorenzo de Chagre, Panama, and Guayaquil, to fall by degrees into ruin, or to keep them up by an annual expence which would be better employed in the augmentation of her military marine. On the good state of that marine, the salubrity of the coast, and the wise distribution of the militia, the defence of Columbia should be founded.

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* *See* above, vol. vi, p. 183.

The insalubrity of Carthagena, exaggerated in the accounts of those who inhabit the upper part (*tierras frias*) of Columbia, varies with the state of the great marshes that surround the town on the east and the north. The *Cienega de Tesca* is more than fifteen miles long; it communicates with the Ocean, where it approaches the village of Guayeper. When, in dry years, the heaped-up earth prevents the salt water from covering the whole plain, the emanations that rise during the heat of the day, when the thermometer keeps up between 28° and 32°, become very pernicious to the health of the inhabitants. A small portion of hilly land separates the town of Carthagena and the isle of Manga de la *Cienega de Tesca.* Those hills, some of which are more than 500 feet high, command the town. The *Castillo de San Lazaro* presents itself from afar like a great rocky pyramid; examined nearer, its fortifications are less formidable. Layers of clay and sand, belonging to the tertiary formation of *nagelfluhe*, are covered with bricks, and furnish a kind of construction which has little stability. The *Cerro de Santa Maria de la Popa*, crowned by a convent and some batteries, rises above the fort of *San Lazaro*, and merits on that account more solid and extensive works. The image of the Virgin, preserved in the church of the convent, has been long revered by the mariners. The hill itself forms a prolonged back, from west to east; and is terminated by a projection, which gives it the aspect of the pump of a vessel. The calcareous rock, filled with cardites, meandrites, and other petrified corals, somewhat resembles the tertiary limestone * of the peninsula of Araya, near Cumana. It is split and decomposed in the steep parts of the rock, and the preservation of the convent, with foundations so little solid, is considered by the people as one of the miracles of the patron of the place. Near *Cerro de la Popa*, there appears, on several points, breche with a limestone cement, containing angular fragments of lydian. Is this formation of *nagelfluhe* superposed on tertiary limestone of coral? Do the fragments of the lydian stone come from secondary limestone †, analogous to that of Zacatecas and Morro de Nueva Barcelona? I have not had leisure to resolve these questions. The view from the *Popa* is extensive and varied, and the windings and rents of the coast give it a peculiar character. I was assured that sometimes from the windows of the convent, and even in the open sea, before the fort of *Boca Chica*, the snowy tops are seen of the *Sierra Nevada de Santa Marta*. The distance of the

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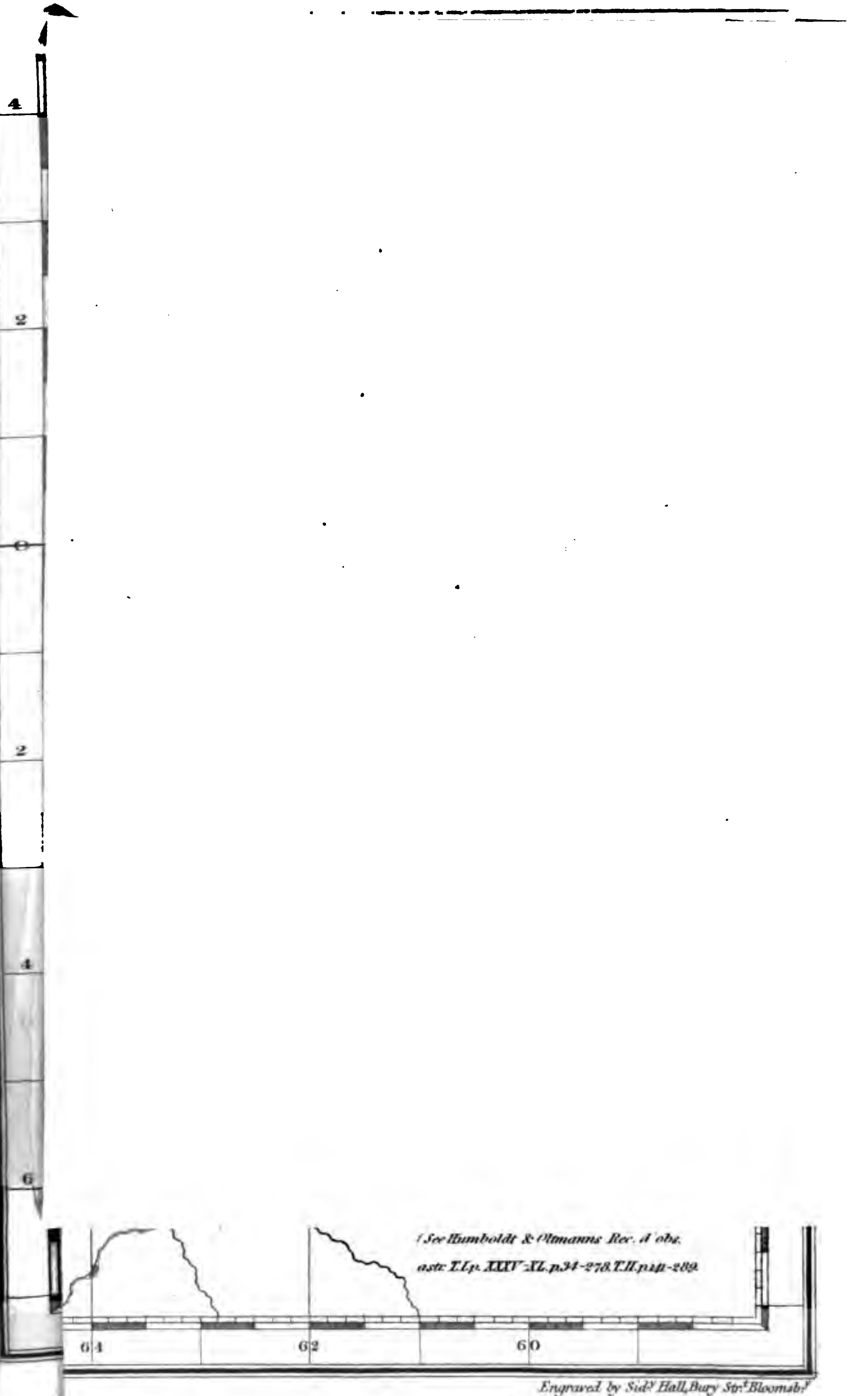
* *See* above, vol. vi, p. 638.

† *L.* c., vol. iii, p. 365; vol. vi, p. 80.

Horqueta to the Popa is seventy-eight marine miles. This groupe of mountains, of a colossal height, is most frequently enwrapped in thick clouds; it remains most veiled at the season when the gales blow with violence. Although it is only forty-five miles distant from the coast, it serves so little as a signal to mariners who seek the port of Saint Martha, that the expedition of Fidalgo, during the whole time of its operations near the shore, could take only once the measurement of the *Nevados*.

A gloomy vegetation of Cactus, Jatropha gossypifolia, Croton, and Mimosa, covers the barren declivity of *Cerro de la Popa*. In herbalizing in those wild spots, our guides shewed us a thick bush of *Acacia cornigera*, become celebrated by a deplorable event. Of all the species of Mimosa, the *Acacia* is that which is armed with the sharpest thorns; they are sometimes two inches long, and being hollow, serve for the habitation of ants of an extraordinary size. A woman, wearied of the jealousy and well founded reproaches of her husband, conceived a project of the most refined vengeance. With the assistance of her lover, she bound her husband with cords, and threw him, at night, into a bush of *Mimosa cornigera*. The more he struggled, the more the ligneous thorns of the tree tore his skin. His cries were heard by per-



(See Humboldt & Oltmanns Rec. d'obs. astr. T.I.p. XXXV-XL. p.34-278. T.II.p.141-289.

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